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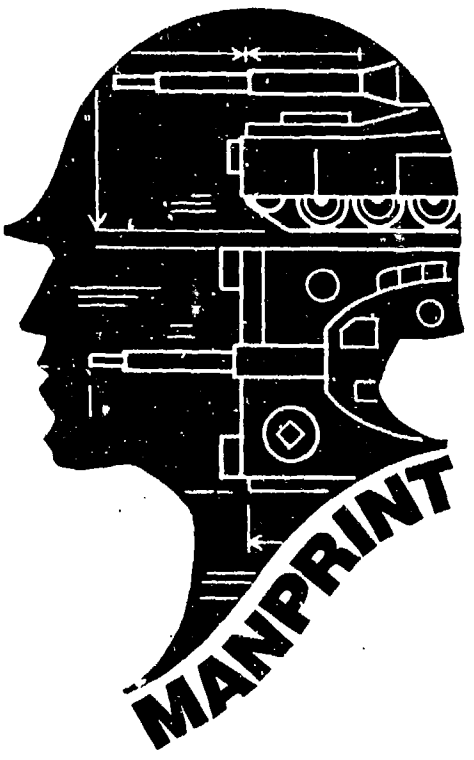
Supplement 1
Draft AMC Circular 602-X

MANPRINT

HANDBOOK FOR RFP DEVELOPMENT



MANPRINT
HANDBOOK FOR RFP DEVELOPMENT

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Workforce Effectiveness and Development
Office of Training and Development
P.O. Box 7230
Washington, D.C. 20044

Contract No. OPM 85-75/W.O. Nos. 475-029, 475-037, 475-043

September 1987

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S) [illegible] 502-X
6a. NAME OF PERFORMING ORGANIZATION Allen Corporation of America 6b. OFFICE SYMBOL (If applicable)	[illegible] ORGANIZATION [illegible] Materiel Command
6c. ADDRESS (City, State, and ZIP Code) 209 Madison Street Alexandria, VA 22314	7b. ADDRESS [illegible] Code) 5001 Eisenhower [illegible] Alexandria, [illegible]
8a. NAME OF FUNDING/SPONSORING ORGANIZATION U.S. Army Research Institute 8b. OFFICE SYMBOL (If applicable) PERI-SM	9. PROCUREMENT [illegible] IDENTIFICATION NUMBER OPM CONTRACT 85-75/W.O. 475-043
8c. ADDRESS (City, State, and ZIP Code) 5001 Eisenhower Avenue Alexandria, VA 22333-5600	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. P623730 / PROJECT NO. A793 / TASK NO. 1.2.5 / WORK UNIT ACCESSION NO. C3

11. TITLE (Include Security Classification)

MANPRINT HANDBOOK FOR RFP DEVELOPMENT (Unclassified)

12. PERSONAL AUTHOR(S) Barber, Jacob L. and Jones, Robert E. Jr, Ching, Harry L. F., Advanced Management Associates, Miles, John L., U.S. Army Research Institute

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
FINAL	FROM 86/6/30 TO 87/9/15	87.9.15	187

16. SUPPLEMENTARY NOTATION

Manpower and Personnel Integration

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)			
FIELD	GROUP	SUB-GROUP	MANPRINT	Personnel	System Safety	System Performance
			RFP,	Training	Health Hazards	Statement of Work
			MANPOWER,	Human Factors	Engineering	Man in the Loop

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

This handbook is designed to assist personnel tasked with preparing a Request for Proposal (RFP) for any phase of a major system development program. It specifically focuses on how to include MANPRINT requirements in the RFP. The Handbook is organized into four chapters and an appendix section. Chapter 1 discusses the six domains that comprise MANPRINT and explains how the domains and their integrated products relate to the materiel acquisition process. Chapter 2 examines each of the six domains separately and identifies both documents and agencies that can provide assistance in RFP preparation. Chapter 3 identifies preceding events and activities that shape the structure and content of the MANPRINT requirements in the RFP. It describes the linkages that should exist and what can be done in the event critical MANPRINT elements are non-existent. Illustrative paragraphs as they should appear in the RFP are provided. Chapter 4 is a summation of activities described in Chapter 3. An RFP for a major notional Army weapon system with significant MANPRINT implications is presented. Those portions of the RFP with MANPRINT input are

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	Unclassified
22a. NAME OF RESPONSIBLE INDIVIDUAL Mr. Warren Theis	22b. TELEPHONE (Include Area Code) (703) 274-5696 / 22c. OFFICE SYMBOL AMCDE-PQA

DD Form 1473, JUN 86 Previous editions are obsolete. SECURITY CLASSIFICATION OF THIS PAGE

UNCLASSIFIED

18. System Specifications

19. shown to demonstrate how and where MANPRINT should be incorporated and what it looks like when its six domains are integrated with one another and MANPRINT itself is fully integrated with other system requirements. Four appendices provide a list of references, a list of abbreviations and acronyms used in the handbook, a list of addresses and telephone numbers of government agencies with major responsibilities in the MANPRINT program, and a document improvement proposal form.

FOREWORD

In preparing this handbook the authors have accepted the challenge of presenting as complete and comprehensive a coverage as possible of Manpower and Personnel Integration (MANPRINT) in the Request for Proposal (RFP) for a developmental system. This is a formidable task given the myriad of details that either MANPRINT or RFP-writing alone would require. To make matters more interesting, this presentation was also intended to result in an easy-to-understand, concise product. Brevity, it was believed, would encourage the RFP drafter to read and subsequently apply knowledge gained from the handbook. The drafting and revising of this handbook have shown that the goals of brevity, clarity and completeness do not always lead in the same direction.

Of the three methods of materiel acquisition available, we have concentrated on the Army Streamlined Acquisition Process (ASAP) to illustrate MANPRINT initiatives. It is the authors' belief that the ASAP method will be the one used in a majority of future Army materiel procurements, and we wish to serve that need. The traditional method will still be used, but less frequently than in the past. The Nondevelopmental Item (NDI) acquisition method will be covered in supplement 2 to the AMC MANPRINT circular.

This handbook will hopefully advance MANPRINT understanding without diminishing either the need or importance of supportability areas such as Integrated Logistic Support (ILS) and Reliability, Availability and Maintainability (RAM). Finally, our efforts to identify aspects of MANPRINT which were in the past the concern of individual domains such as Human Factors Engineering, System Safety or Health Hazards, should be viewed as efforts to strengthen the integration of MANPRINT rather than efforts to diminish the importance or need for those domains.

Finally, the authors wish to thank the many people who offered suggestions for revision of the fifth draft of this document. Nearly 300 comments from more than two dozen sources were received and studied, and approximately 70% were incorporated into this edition.

PREFACE

This handbook is intended to assist personnel tasked with preparing an RFP for any phase of a major system development program. It explains how to include MANPRINT statements in the RFP.

The handbook focuses on the six interrelated domains of MANPRINT and how they are to be described in the different RFP sections. The MANPRINT domains are:

1) Manpower
2) Personnel
3) Training
4) Human Factors Engineering
5) System Safety
6) Health Hazard Assessment

This handbook is organized as follows:

CHAPTER 1 introduces the subject matter of the six domains that are currently combined and integrated into the Army MANPRINT program. The chapter explains how MANPRINT applies these domains (and their integrated products) to the *design* of hardware and software to form a complete manned system.

CHAPTER 2 provides details on each of the six domains of MANPRINT, and identifies in each domain both documents and agencies which can provide assistance in RFP preparation. (Office file symbols, addresses and telephone numbers which are subject to more frequent changes are separated and shown in Appendix C.)

CHAPTER 3 contains detailed guidance for preparing the MANPRINT portions of an RFP. Also included are illustrative paragraphs which interpret this guidance and show how MANPRINT requirements might appear in an RFP. These illustrative paragraphs are general in nature and were designed to be applicable to major and complex systems such as aircraft, combat vehicles or weapon systems. For less complex systems the paragraphs would be selectively omitted, modified, or tailored to express the MANPRINT requirements appropriate to the materiel being developed. This has been done in the example RFP in Chapter 4.

CHAPTER 4 contains the product of the activities described in Chapter 3. While the RFP is not presented in its entirety, enough of those parts with MANPRINT input are shown to provide the RFP drafter a sound understanding of how and where MANPRINT should be incorporated, and what it looks like when its six domains are integrated with one another and MANPRINT itself is fully integrated with other system requirements. This example selectively applies

material adapted from Chapter 3 modified to fit the MANPRINT requirements of an anti-armor weapon system. Material not needed for such a system has been omitted, necessary detail has been added, and the MANPRINT requirements organized within the context of a "real world" RFP. Chapters 3 and 4 are the heart of this handbook and should be consulted in the preparation of each RFP.

APPENDIX A is a list of references used in the preparation of this handbook which the reader can consult for more detail in particular areas.

APPENDIX B is a list of abbreviations and acronyms used in this handbook.

APPENDIX C contains addresses and phone numbers (current to April, 1987) of those government agencies involved in the MANPRINT program from whom consultation and assistance in the preparation of an RFP can reasonably be expected.

APPENDIX D is a means for users of this handbook to identify any portions of it which need improvement or correction and to indicate a desire to be placed on the mailing list to receive updated pages as they become available. The form, when completed, may be mailed to the proponent of this document.

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CHAPTER 1

INTRODUCTION/PURPOSE

1.1 **What is MANPRINT?** The Department of the Army describes Manpower and Personnel Integration (MANPRINT) as a comprehensive management and technical program to improve total system (soldier, hardware and software) performance by the continuous integration of Manpower, Personnel, Training, Human Factors Engineering, System Safety, and Health Hazard considerations throughout the materiel development and acquisition process.

1.2 **The MANPRINT Initiative.** The recent urgent need to resolve the dilemma between the rapidly increasing complexity of military hardware (coupled with an attendant need for trained high-skill soldiers) which has accompanied the post-Vietnam Army Modernization Program and the anticipted finite limits on the number and quality of soldiers who may be available in the 1990s have moved MANPRINT into the forefront of materiel acquisition planning. Studies showed that while Army units might possess the most sophisticated and theoretically superior equipment, total performance potential might not be realized unless soldier performance was also highly effective. In the past, increased capability achieved with advanced technology was often accompanied by increases in soldier task complexity. Materiel design was not always guided by a disciplined process that insisted on putting "the soldier-in-the-loop." Moreover, the design process was often built on the unstated assumption that sufficient numbers of skilled soldiers would always be available to operate, maintain, and support the hardware.

1.3 **MANPRINT Integration.** The key words in the MANPRINT process are "integration" and "...throughout materiel development and acquisition...". New Equipment Training (NET), development of new institutional training programs, Basis of Issue Plans (BOIP), Qualitative and Quantitative Personnel Requirements Information (QQPRI), Manpower Requirement Criteria (MARC), and MOS determination have long had their place in the fielding of newly developed Army equipment. System Safety Assessment, Health Hazard Assessment, Human Factors Engineering, and TOE development are also not new to Army system development. What then is new about the MANPRINT initiative, and what is it that MANPRINT integrates? First, the MANPRINT program integrates the activities in the six existing domains of Manpower, Personnel, Training (MPT), Human Factors Engineering (HFE), System Safety (SS), and Health Hazard (HH) assessment. It seeks not only integration among them but has the broader objective of integrating these with relevant design activities in traditional areas of maintenance, logistics, and support. In so doing, the MANPRINT process focuses concern not only on the individual soldier but also on the units which will employ, maintain, and support new materiel (Figure 1).

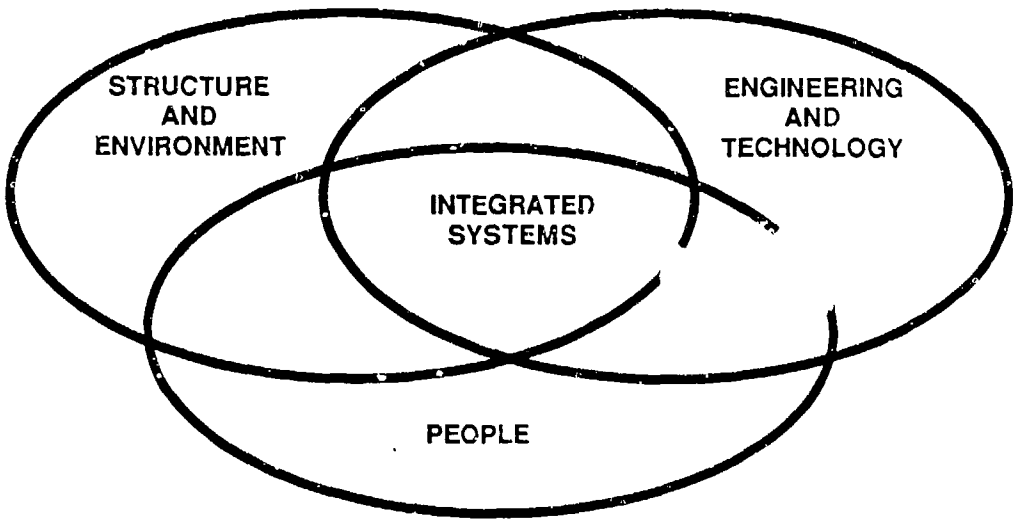

FIGURE 1
MANPOWER AND PERSONNEL INTEGRATION

The second new element in the MANPRINT program is the insistence that technical information from the MANPRINT domains should play a prominent role in guiding the decisions which determine the design characteristics of new materiel from concept formulation phase through the deployment phase. Thus, the answer to the question, "Why MANPRINT?," is that MANPRINT contributes to total system effectiveness through improved: soldier performance, manpower/personnel utilization, and unit effectiveness.

1.4 **Is MANPRINT Part of the Integrated Logistic System (ILS)?** This handbook attempts to follow established Army policy, not to create new policy. Within this handbook it was not feasible to cover MANPRINT conducted both as a part of an ILS program and as a separate program. There is an acknowledged partial overlap among elements of ILS and the domains of MANPRINT. Therefore frequent and open communication, interchange of information and data, coordination of data requirements, use of common data and data bases between ILS and MANPRINT is mandatory. Otherwise, duplicative, costly and possibly conflicting efforts will result. Such is the case whether or not MANPRINT is part of ILS. ILS and Logistic Support Analysis (LSA) are well established, well documented, and generally more widely understood than the MANPRINT process. Therefore, it seemed more efficient to limit this handbook to the treatment of MANPRINT where documentation is sparse and much needed. The approach avoids repetition of voluminous ILS/LSA material and precludes potential inconsistencies with existing documentation. But most importantly, this approach allows more complete treatment of MANPRINT in the RFP without burdening the reader by duplicating ILS/LSA material available elsewhere. Therefore, this hand-

book does not attempt to integrate MANPRINT with ILS/LSA, but does try to facilitate the necessary interaction through frequent reminders of areas of mutual interest and through the inclusion of numerous ILS/LSA references.

1.5 **Streamlined Acquisition.** At the same time that it is applying the MANPRINT process, the Army is also streamlining the acquisition cycle. Traditionally, the development of new equipment took enough time from conception to deployment that a system could be technologically obsolete before it was fielded. A current initiative called the Army Streamlined Acquisition Process (ASAP) accelerates fielding by adopting a simpler, more flexible approach to materiel acquisition without sacrificing quality (Figure 2).

Key features of ASAP include:

a. Structuring requirements for pursuit of companion "now" and "later" capabilities which foster low risk development for the near term with a potential for growth under Preplanned Product Improvement (P3I) programs.

b. Early focus of technology on mission area needs and maturation of technology at component level.

c. Combining user experimentation and troop demonstrations to prove out both the technical approach and operational concept before proceeding to full scale development. There is no requirement to proceed in a lockstep sequence.

d. Solid proveout of production including hand-tooled prototypes whenever possible prior to entry into Production-Deployment phase.

e. Integrated Technical Testing/Operational Testing (TT/OT) approach, and wider sharing of test data, via a common data base and continuous evaluation throughout the life cycle.

f. Minor reorientation of formal milestones.

Thus, although the traditional acquisition process will continue to be used, especially in the more complex acquisitions involving state-of-the-art technology and greater risks, the ASAP is expected to be the manner by which the Army will acquire most of its materiel in the foreseeable future.

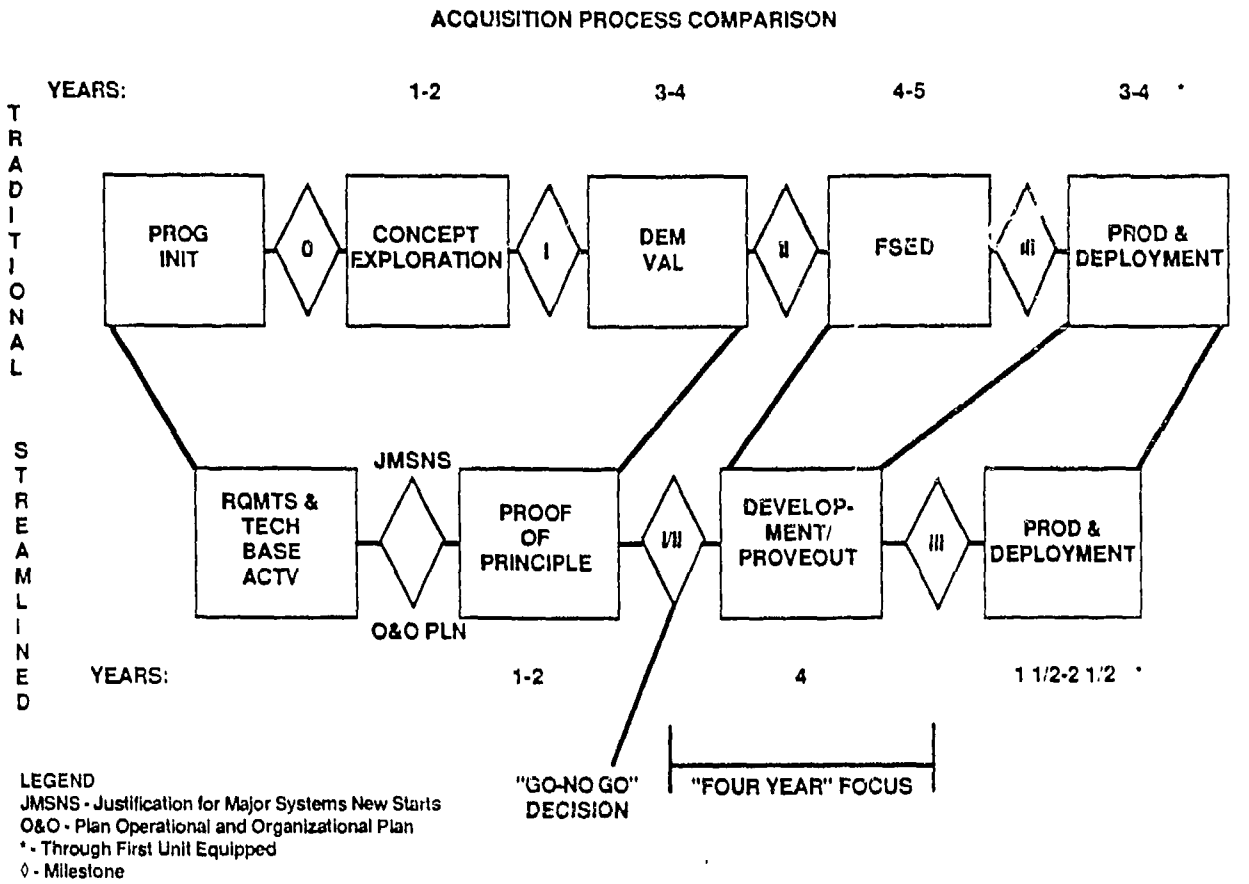

FIGURE 2
ACQUISITION PROCESS COMPARISON

1.6 **MANPRINT at the RFP Stage.** The principal means by which the Army formally communicates its materiel requirements to industry is the Request for Proposal. The process of preparing an RFP is led by the Army materiel developer with the support and assistance of the combat developer and specialists from other agencies. In communicating its requirements to industry, the Army must clearly state what it is that it wishes to procure. The procedures by which this is accomplished are well established under a body of laws, regulations and policies that govern materiel acquisition. What is required for implementation of a new initiative such as MANPRINT is to take the technological requirements arising from an operational need and convert them into relevant procurement language which is understood and can be responded to by industry. U.S. Army Training and Doctrine Command (TRADOC) documents, such as the O&O Plan and ROC delineate those requirements to the materiel developer. MANPRINT along with other requirements are "refined" into contractual language and the result is a solicitation document such as the RFP. In short, the RFP portends a contract and describes the product and services that the government wishes to procure. For convenience we have called this period of transition from requirements document to RFP the "Definition" process (Figure 3).

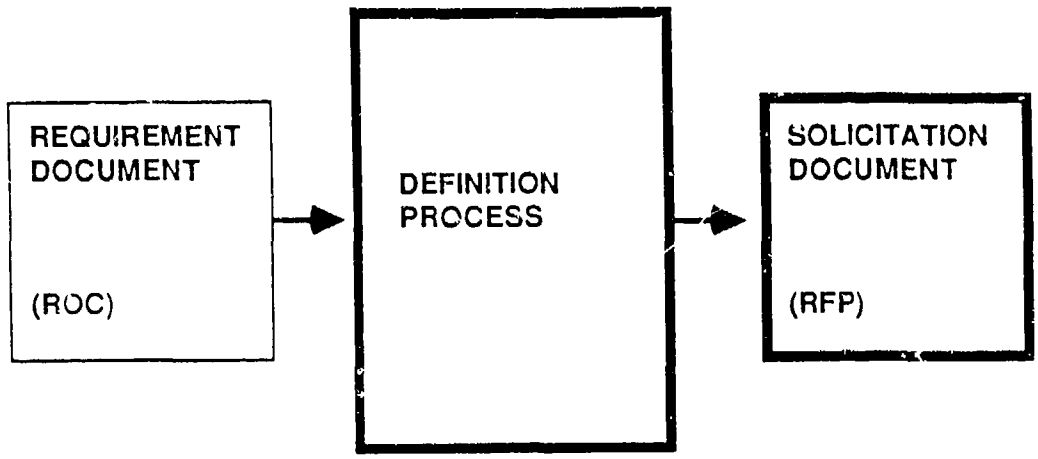

FIGURE 3
THE DEFINITION PROCESS

It is also important to recognize that, during the life cycle of a single materiel item, RFPs may be written in each of several stages. For instance, requirements processing through the proof of principle, development/proveout, and production and deployment phases may each go through a definition process and emerge in an RFP. There are some qualitative differences in the way MANPRINT affects the RFP in each of those phases. Generally, if MANPRINT is to contribute to effective system design, its influence must be felt during the earliest acquisition phase. Some key design questions (for instance, the choice of crew size and, hence, the basic architecture of a vehicle) may hinge on MANPRINT studies. As the system design matures, MANPRINT focuses less on the design and turns to efficiency considerations, such as the human aspects of supportability. In selecting the Development/Proveout phase for the illustrative focus of this handbook, the authors have chosen to exploit the maturity of the system componentry and the relative completeness of requirements documentation at this stage to illustrate MANPRINT applications.

1.7 **Industry Involvement in MANPRINT.** Recent changes in Army policy now bring industry into an earlier involvement in the materiel acquisition process. Copies of draft requirement documents such as the O&O Plan and ROC as well as draft solicitation documents such as the RFP are now circulated to potential contractors in order to improve communications with industry concerning the Army's materiel requirements and to provide the Army a better understanding of industry's technological capabilities. This arrangement provides industry early insight into requirements such as MANPRINT with respect to a specific acquisition program and provides the Army feedback concerning industry's abilities to meet such requirements.

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CHAPTER 2

GETTING ORGANIZED FOR MANPRINT

2.1 **The MANPRINT Domains.** This chapter discusses the six domains of MANPRINT in a manner which should assist the RFP drafter in organizing his tasks. Each of the domains, Manpower, Personnel, Training, Human Factors Engineering, System Safety and Health Hazard Assessment, will be discussed in the following sequence:

a. *What* is this domain all about?
b. *Who* can help?
c. *What* guidance is available?

After reading this chapter, the person concerned with preparing MANPRINT requirements in the RFP should be equipped with an understanding of each domain and the sources which may offer assistance in the event the help is needed. Please note that both the References and the Sources of Assistance are abbreviated to facilitate a quick grasp of the factor in question. More expanded lists are provided at Appendices A and C respectively.

2.2 Manpower.

2.2.1 **Definition.** Manpower refers to the human resource requirements and authorizations (spaces) needed for the operation, maintenance, and support of each item of hardware. It requires a determination of the Army manpower changes generated by each proposed new system, comparing the new manpower needs with those of any old system(s) being replaced, and an assessment of the impact of the changes on the total manpower limits of the Army. If, given manpower priorities established by Headquarters, Department of the Army (HQDA), systems cannot be supported by projected manpower resources, then changes in system design, organization, or doctrine must be made to achieve affordability. In the materiel acquisition process, manpower analyses and actions are necessarily conducted in conjunction with force structure and budget processes.

2.2.2 **Sources of Assistance.**

Source	Type Assistance
U.S. Army Materiel Command (AMC)	• Basis of Issue Plan Feeder Data/ Qualitative and Quantitative Personnel Requirements Information (BOIPFD/QQPRI)

Deputy Chief of Staff for Operations and Plans Headquarters, Department of the Army (DCSOPS, HQDA)	• Force Structure
Deputy Chief of Staff for Personnel, Headquarters, Department of The Army (DCSPER, HQDA)	• MANPRINT Policy • Army Systems Acquisition Review Council/(ASARC) Manpower Issues
U.S. Army Military Personnel Center (MILPERCEN)	• Manpower Issues
U.S. Army Soldier Support Center, National Capital Region (SSC, NCR)	• Hardware versus MANPOWER Methodology (HARDMAN) • Early Comparability Analysis (ECA)
TRADOC	• Basis Of Issue Plan/ Qualitative and Quantitative Personnel Requirements Information (BOIP/QQPRI) • Target Audience Description (TAD)
TRADOC Proponent School MANPRINT Joint Working Group (MJWG)	• System MANPRINT Management Plan (SMMP) • Operational and Organizational Plan (O&O Plan) • Justification Major System New Start (JMSNS) • ROC

2.2.3 **References.**

AR 570-1	Manpower and Equipment Control-Commissioned Officer Position Criteria
AR 570-2	Manpower and Equipment Control-Manpower Requirement Criteria (MARC) Table of Organization and Equipment (TOE)
AR 570-5	Manpower Staffing, Standards System

AR 602-2 Manpower and Personnel Integration (MANPRINT) in Materiel Acquisition Process

AR 611-101 Commissioned Officer Specialty Classification System

AR 611-112 Manual of Warrant Officer Military Occupational Specialties

AR 611-201 Enlisted Career Management Fields and Military Occupational Specialties

AR 700-127 Integrated Logistic Support

2.3 **Personnel.**

2.3.1 **Definition.** Personnel considers the aptitudes, experience, and other human physical and mental characteristics needed by those who will be required to operate, maintain and support Army equipment. It also considers the military and civilian persons of the skill level and grades required to operate and support a system, in peacetime and war. It requires detailed assessment of the aptitudes which soldiers must possess in order to complete training and use, operate and/or maintain the system successfully. Iterative analyses must be accomplished as integral components of the new system design process, comparing projected quantities of qualified personnel with requirements of the new system, any system(s) being replaced, overall Army needs for similarly qualified people, and priorities established by the Department of the Army. As necessary, the system is configured specifically to accommodate the probable capabilities of personnel projected to be available, so that the new system is supportable from a personnel standpoint. Analysis of specific system personnel requirements using human factors engineering is necessary for each system design option considered, using "best available" information early in the acquisition process and improved information as the system design becomes firmer. Personnel analyses must consider not only simple availability, but also the capability of the Army personnel management system to provide the needed numbers of properly qualified people at a reasonable cost. Personnel must be included in system life cycle cost estimates and system design tradeoffs--machine costs versus personnel costs. Personnel analyses and projections are needed in time to allow orderly recruitment, training and assignment of personnel in conjunction with equipment fielding.

2.3.2 **Sources of Assistance.**

Sources	**Type Assistance**
AMC	• BOIPFD/QQPRI • LSA Input
U.S. Army Research Institute (ARI)	• MPT Measurement and Assessment

DCSPER, HQDA	• MANPRINT Policy
MILPERCEN	• Personnel Data
SSC, NCR	• HARDMAN Methodology • ECA
TRADOC	• BOIP/QQPRI • TAD
TRADOC Proponent School MJWG	• SMMP • O&O Plan • JMSNS • ROC • Personnel Issues and Criteria • LSA Input

2.3.3 **References.**

AR 70-8 Personnel Performance and Training Program (PPTP)

AR 71-2 Basis of Issue Plans (BOIP), Qualitative and Quantitative Personnel Requirements Information (QQPRI)

AR 602-2 Manpower and Personnel Integration (MANPRINT) in Materiel Acquisition Process

AR 611-101 Commissioned Officer Specialty Classification System

AR 611-112 Manual of Warrant Officer Military Occupational Specialties

AR 611-201 Enlisted Career Management Fields and Military Occupational Specialties

AR 680-29 Military Personnel, Organization and Types of Transaction Codes

MIL-STD-1388-1A Logistic Support Analysis

MIL-STD-1388-2A Logistic Support Analysis Record

Lowry, J. and Seaver, D., Handbook for Quantitative Analysis of MANPRINT Considerations in Army Systems. Alexandria, VA: Allen Corporation of America Report TR-86-1, June 1986.

2.4 **Training.**

2.4.1 **Definition.** Training consists of the instruction, time and other resources necessary to impart the requisite knowledge, skills, and

abilities to qualify Army personnel for operation, maintenance, and support of Army equipment. Training is conducted at the institution (i.e., TRADOC schools), and in the unit. It involves (1) the formulation and selection of engineering design alternatives which are supportable from a training perspective, (2) the documentation of training strategies, and (3) the timely determination of resource requirements to enable the Army training system to support system fielding. Formulating the training of a new system requires analyses that take into account the expected soldier aptitude levels, the nature and complexity of knowledge and skills to be acquired, and the proficiency levels to be attained and sustained. Identifying and, where possible, minimizing the requirements in all three of these areas should be an important consideration in selecting engineering design alternatives. The training package for a new system should include a documented training program for individuals and units (including training materials, any provision for embedded training, and training devices, if appropriate); the process of transmitting the new knowledge to the Army (through factory training, NET, training of test personnel, and the evaluation of the new training itself); and the timely identification of resource requirements to enable the Army training establishment to support system fielding.

2.4.2 **Sources of Assistance.**

Sources	Type Assistance
AMC	• New Equipment Training Plan (NETP) • Training Utility Evaluation • LSA Input
DCSPER, HQDA	• MANPRINT Policy
Project Manager for Training Devices (PM TRADE)	• Training Devices
SSC, NCR	• HARDMAN Methodology • ECA
TRADOC	• Training Constraints • Training Issues and Criteria • BOIP/QQPRI • Army Training Evaluation Program (ARTEP) • Skill Qualification Test (SQT) Scores

- Individual and Collective Training Plan (ICTP)
- LSA Input

TRADOC Proponent School
MJWG

- SMMP
- O&O Plan
- JMSNS
- ROC

2.4.3 **References.**

AR 350-35	Army Modernization Training
AR 350-38	Training Device Policies and Management
AR 602-2	Manpower and Personnel Integration (MANPRINT) in Materiel Acquisition Process
TRADOC Reg 350-7	A Systems Approach to Training
TRADOC Reg 350-17	Initial Entry Training Fill Policy and Procedures
TRADOC PAM 350-30	Interservice Procedures for Instructional Development
TRADOC Reg 351-1	Training Requirements Analysis System
MIL-STD-1379B	Contract Training Programs
MIL-STD-1379C	Military Training Programs
MIL-T-23991	Training Devices, Military, General Specification for

2.5 **Human Factors Engineering (HFE).**

2.5.1 **Definition.** Human Factors Engineering deals with the design of Army materiel to ensure that its use conforms to the capabilities and limitations of the fully equipped range of soldiers that operate, maintain, supply, and transport the materiel in the operational environment. It includes those aspects of systems analysis that determine the role of the soldier in a materiel system, defining and developing soldier-materiel interface characteristics, workplace layout, and work environment. HFE provides soldier-materiel task sequence data used to describe, develop, and assess the feasibility of human performance required in a soldier-materiel system application and involves considerations of all relevant information pertaining to the following:

- Human characteristics
- Anthropometric data
- System interface requirements
- Human performance
- Biomedical factors
- Safety factors

In addition, human factors engineering analyses pertaining to the following are used as inputs to the consideration of Manpower, Personnel, and Training issues in the MAP.

- System manning levels
- User, operator, and maintainer capability requirements

The adequacy of system HFE is evaluated during both development and operational testing.

2.5.2 **Sources of Assistance.**

Sources	Type Assistance
DCSPER, HQDA	• MANPRINT Policy
U.S. Army Human Engineering Laboratory (HEL)	• Human Factors Engineering Analysis (HFEA)
U.S. Army Health Services Command (USAHSC)	• Health Hazard Issues
U.S. Army Medical Research and Development Command (USAMRDC)	• Health Hazard Issues
U.S. Army Operational Test and Evaluation Agency (OTEA)	• MANPRINT Operational Testing
U.S. Army Test and Evaluation Command (TECOM)	• MANPRINT Testing
The Surgeon General of the Army (TSG)	• Health Hazard Assessments • Biomedical/Health Standards

2.5.3 **References.**

AR 602-1	Human Factors Engineering Program
AR 602-2	Manpower and Personnel Integration (MANPRINT) in Materiel Aquisition Process
MIL-STD-1472	Human Engineering Design Criteria for Military Systems

MIL-STD-1474	Noise Limits for Army Materiel
MIL-STD-1567	Work Measurements
DOD-HDBK-743	Anthropometry of U.S. Military Personnel
MIL-HDBK-759	Human Factors Engineering for Army Materiel
MIL-HDBK-761	Human Engineering Guidelines for Management Information Systems
MIL-H-46855	Human Engineering Requirements for Military Systems, Equipment and Facilities
Aeronautical Design Standards ADS-30	Human Engineering Requirements for Measurement of Operator Workload
TR-77-024	Anthropometry of Women of the U.S. Army--1977 (NATICK R&D Command Report #II)

2.6. System Safety.

2.6.1 **Definition.** System safety concerns the attainment of the optimum degree of safety consistent with mission requirements. It involves the identification, elimination, or management control of safety hazards. Systems safety management ensures the planning, implementation, and completion of tasks and activities to meet system safety requirements, consistent with overall program goals. Safety considerations are incorporated into the soldier-machine interface design to satisfy stated tasks, conditions, and standards, and into test and evaluation.

2.6.2 **Sources of Assistance.**

Sources	Types of Assistance
AMC Safety Office	• Safety Issues
USAMRDC	• Health and Safety Issues • Medical Materiel Development and Acquisition
USAHSC	• Health Hazard Assessments for Materiel Systems
U.S. Army Safety Center (USASC)	• System Safety Issues • Safety Assessment Reports

TSG	• System Health Assessments • Biomedical/Health Standards • Use of volunteers in Testing and Evaluation (T&E)

2.6.3 **References.**

AR 385-10	Army Safety Program
AR 385-16	Systems Safety Engineering and Management
AR 602-2	Manpower and Personnel Integration (MANPRINT) in Materiel Acquisition Process
MIL-STD-882	System Safety Program Requirements
MIL-STD-1290	Light Fixed and Rotary-Wing Aircraft Crashworthiness
MIL-STD-1425	Safety Design Requirements for Military Lasers and Associated Support Equipment
DA PAM 385-16	System Safety Management Guide
AMC Reg 385-29	Laser Safety

2.7 **Health Hazards Assessment.**

2.7.1 **Definition.** Health Hazard Assessment involves the application of biomedical knowledge and principles to identify, evaluate, and control risks to the health and effectiveness of personnel who test, use, maintain, and support Army materiel. A health hazard is any existing or likely condition, inherent to the operation or use of materiel, which can cause death, injury, acute or chronic illness, disability, or reduced job performance of personnel by exposure to:

- Acoustical Energy (steady state noise, impulse noise, blast overpressures)
- Biological Substances (Pathogenic microorganisms and sanitation)
- Chemical Substances (Weapon/engine combustion products and other toxic materials)
- Oxygen Deficiency (confined spaces and high altitude)
- Psychological Stresses (The effects of nuclear, chemical and electronic warfare, and the result of continuous operations)
- Radiation Energy (ionizing and nonionizing--to include lasers)

- Shock (acceleration/deceleration)
- Temperature Extremes and Humidity (heat and cold injury)
- Trauma (blunt, sharp, or musculoskeletal)
- Vibration (whole body and segmental)

2.7.2 **Sources of Assistance.**

Sources	Type Assistance
AMC	• Technical Testing • Monitoring of HHA
USAMRDC	• Health Hazard Issues • Medical Materiel Development and Acquisition • Biomedical Technical Data Base
USAHSC	• Health Hazard Issues • Health Hazard Assessments
TRADOC	• MANPRINT Issues in Doctrinal, Combat, and Training Development
TSG	• System Health Assessments • Biomedical/Health Standards • Use of volunteers in T&E • Overall HHA Program Management
Walter Reed Army Institute of Research (WRAIR) Division of Neuropsychiatry	• Psychological Issues • Continuous Operations

2.7.3 **References.**

AR 40-5	Health and Environment
AR 40-10	Health Hazard Assessment in Support of the Army Materiel Acquisition Decision Process

AR 40-14	Control and Recording Procedures for Exposure to Ionizing Radiation and Radioactive Materials
AR 40-46	Control of Health Hazards from Lasers and Other High Intensity Optical Sources
AR 40-583	Control of Potential Hazards to Health from Microwave and Radio Frequency Radiation
AR 70-25	Use of Volunteers as Subjects of Research
AR 385-9	Safety Requirements for Military Lasers
AR 385-11	Ionizing Radiation Protection, Licensing, Control, Transportation Disposal and Radiation Safety
AR 602-2	Manpower and Personnel Integration (MANPRINT) in Materiel Acquisition Process
MIL-HDBK-759	Human Factors Engineering Design for Army Materiel
MIL-STD-858	Testing Standard for Personnel Parachutes
MIL-STD-1290	Light Fixed and Rotary Wing Aircraft Crash Worthiness
MIL-STD-1294	Acoustical Noise Limits in Helicopters
MIL-STD-1472	Human Engineering Design Criteria for Military Systems Equipment and Facilities
MIL-STD-1474	Noise Limits for Army Materiel
TB MED 81	Cold Injury
TB MED 501	Hearing Conservation
TB MED 502	Respiratory Protection Programs
TB MED 506	Occupational Vision
TB MED 507	Prevention, Treatment, and Control of Heat Injury
TB MED 523	Control of Hazards to Health from Microwave and Radio Frequency Radiation and Ultrasound

CHAPTER 3

WRITING THE RFP

3.1 **Pre-RFP Activities.** By the time you receive the assignment to begin drafting the RFP for a system, many events and activities will already have taken place concerning that system. Some of them are important in shaping the structure and content of the RFP. In the following paragraphs, some significant activities and actions will be discussed. For each activity or action, this handbook will identify:

a. *What* the activity or action is,
b. *Who* is responsible, and
c. *How* it relates to the RFP.

3.1.1 **TRADOC MANPRINT Joint Working Group (MJWG).**

a. The MJWG is a committee to manage MANPRINT issues during the materiel acquisition process. The exact make up and leadership is determined by the TRADOC proponent school based on assets available and the type of acquisition conducted. Suggestions for representation include Directorate of Combat Developments, Directorate of Training and Doctrine, Directorate of Evaluation and Standardization, Safety Office Proponency Office, HEL, ARI, Office of the Surgeon General, Integrating Centers, AMC/MSC/PM MANPRINT Manager, PM TRADE, AMC independent evaluator and supporting proponent schools. The exact make-up should be determined by the proponent based on the assets available and the type of acquisition conducted.

b. The MJWG is established by the TRADOC proponent school. MJWG responsibilities include:

- Writing the SMMP
- Providing guidance for HARDMAN analysis
- Identifying personnel issues and criteria
- Recommending HFEA on all DoD major, designated acquisition, and in-process review (IPR) programs having soldier-materiel interface.

c. The MJWG is the focal point for system MANPRINT issues during TRADOC's formulation of the requirements document. If the RFP drafter is not a member of the MJWG, contact should immediately be established with this group through the TRADOC proponent school. The key document to obtain is the SMMP.

3.1.2 System MANPRINT Management Plan (SMMP).

a. The SMMP is the MANPRINT management guide that is prepared for each development, non-development, and product improvement system. It is a plan which identifies the important MANPRINT issues anticipated in the system acquisition and assigns responsibility for resolving those issues. It is the first program management document in the entire acquisition cycle and is initially prepared by the MJWG in the same timeframe as the O&O Plan. Personnel preparing the O&O Plan should address the concerns expressed in the SMMP in the appropriate areas of the O&O Plan, e.g., Paragraph VII.

b. The SMMP is initiated by the TRADOC proponent school MJWG.

c. The SMMP functions as an audit trail to identify all the tasks, analyses, trade-offs, and decisions that affect MANPRINT issues of a system. However, the SMMP itself is not a collection of documents. The documents must be obtained from other sources. If the RFP drafter has a question concerning a MANPRINT issue, the SMMP is the first place to look for an answer or for guidance concerning how that issue has been treated.

3.1.3 Test and Evaluation Master Plan (TEMP).

a. The TEMP is a broad plan that relates test objectives to required system characteristics and critical issues, including MANPRINT issues, in the system acquisition.

b. Responsibility for the TEMP rests with the Materiel Developer in the major subordinate command.

c. The RFP drafter should ascertain whether a TEMP exists and, if it does, should search the TEMP for important MANPRINT issues and criteria (usually found in the Independent Evaluation Plan (IEP) or an Independent Evaluation Report (IER) if there has been a previous phase of development of the system and the MANPRINT Annex to the TEMP). The RFP drafter must ensure that MANPRINT issues not only are identified, but are included in the appropriate quality assurance portions of the RFP as well. Whether or not required by the TEMP, the RFP should require the collection of individual soldier performance data during all system operation and maintenance testing (see AR 602-2, para 2-12).

3.1.4 Cost and Operational Effectiveness Analysis (COEA).

a. A COEA is prepared to support decision milestones regarding materiel acquisition. This analysis is a comparative evaluation of the competing alternatives generally defined as systems and programs. It identifies the relative effectiveness and associated costs of each alternative in order to assist decision makers in selecting the preferred course of action to meet an identified need.

b. The combat developer is responsible for initiating, performing, and reporting the cost effectiveness analysis. In special cases the analysis will be prepared by or under the supervision of a special task force or special study group. On occasion an agency outside the Army may prepare an independent analysis directed by Congress, OSD or HQDA. In all cases, the materiel developer is a major participant and contributor to the analysis.

c. The RFP drafter can expect to find estimates of manpower and personnel costs in the COEA including training costs and projections of the cost of recruiting and retaining soldiers with the required aptitudes.

3.1.5 Cost and Training Effectiveness Analysis (CTEA).

a. For training programs, a CTEA will be conducted as part of a system specific COEA or as a separate analysis. The CTEA is conducted to compare alternative training programs for systems in development or already fielded systems in the same manner that the COEA is conducted for hardware systems and programs.

b. Like the COEA, the CTEA is the responsibility of, and is usually prepared by the combat developer. The CTEA frequently addresses training devices, simulators and simulations as part of the training program. Therefore, as with the COEA, the materiel developer is a major participant and contributor to the CTEA.

c. The CTEA will address the manpower and personnel resources and costs for the training program alternatives addressed.

3.1.6 Human Factors Engineering Analysis (HFEA).

a. The HFEA is an analysis, performed in support of the Army Systems Acquisition Review Counsel (ASARC) preliminary review to identify any HFE problems which may be of sufficient criticality to preclude the systems proceeding into the next phase of the acquisition process. It is, in effect, a report card. The HFEA also identifies concerns which, while not critical in terms of program decisions, are resolvable, and must be addressed during the subsequent phase of the acquisition cycle.

b. Following Milestone I, the HFEA is requested by the PM or the AMC Commodity Command from the Human Engineering Laboratory. In practice, an HFEA is usually requested through TRADOC channels prior to Milestone I.

c. If an HFEA exists from a prior phase of system development, it offers the RFP drafter an opportunity to review MANPRINT issues that were previously found to affect the system under consideration, and to identify issues that should be addressed in the Statement of Work (SOW). The

RFP drafter should also review the PM's response to the HFEA issues to determine planned fixes to those issues.

3.1.7 Trade-Off Analysis (TOA).

a. The TOA contains the mission and performance rationale, analysis of system trade-offs, and the selection of the best technical approach from an operational and logistical standpoint.

b. The TOA is jointly prepared by the combat and materiel developers.

c. The RFP drafter can expect to find information identifying critical design factors and potential MANPRINT cost drivers.

3.1.8 Target Audience Description (TAD).

a. The TAD is a quantitative and qualitative summary of the soldiers and civilians who will operate, maintain, and support a proposed system. It describes the aptitude score distribution, which is especially important in developing the training program in that it directly affects training time and other training resources required to attain a specified level of proficiency. It also describes the range of individual qualifications on physical, mental, physiological, biographical, and other dimensions and is the RFP drafter's best source of information relevant to MOS and other personnel issues.

b. TRADOC is responsible for developing the TAD. If assistance is needed in this area, the RFP drafter should contact the TRADOC proponent school combat developer and request assistance.

c. The RFP drafter must draw upon the information contained in the TAD to identify for potential offerors the types of people who will operate, maintain, and support the proposed system.

3.1.9 Operational and Organizational Plan (O&O Plan).

a. The O&O Plan is the program initiation document for all materiel acquisition programs except major systems requiring a Justification Major System New Starts (JMSNS) or systems requiring a Training Device Need Statement (TDNS). It outlines how a materiel system is planned to be used and supported, how it will ultimately contribute to combat capability, and in what organizations the system will be placed. If applicable, it identifies the system(s) to be replaced. Paragraph VI, Organizational Plan, and Paragraph VII, System Constraints, of the O&O Plan may contain statements of significant MANPRINT impact.

b. The O&O Plan is prepared by the combat developer in coordination with others. It is approved by the Commander, TRADOC.

c. The O&O Plan is a source document for the ROC. MANPRINT requirements and constraints would normally flow from the O&O Plan through the ROC to the RFP as explained below. In the event the draft O&O Plan has been provided to potential offerors for comment, the RFP drafter should review industry comments for additional MANPRINT concerns.

3.1.10 **Required Operational Capability (ROC).**

a. The ROC is a formal requirements document which, when approved and funded, commits a program to a development or production decision. It will not normally be approved until proof of principle has been conducted under an approved O&O Plan. The ROC identifies the threat; operational; reliability, availability, and maintainability (RAM); technical; MANPRINT; logistical; and cost information necessary to start development or acquisition of a materiel system. Paragraphs 5 and 8 in all new ROCs will address MANPRINT requirements.

b. The ROC is prepared by the proponent combat developer in coordination with HQDA; materiel developer; training developer; rationalization, standardization, and interoperability (RSI) manager; logistician; MANPRINT planner; tester and evaluator; and interested major command (MACOM).

c. The ROC is a prime source of input for the RFP. MANPRINT goals, constraints and requirements are taken from the ROC, refined as necessary, and inserted into the RFP. In the event the draft ROC has been provided to potential offerors for comment, the RFP drafter should review industry comments for additional MANPRINT concerns.

3.2 **Drafting the RFP.** The definition process (Figure 3) is essentially an analytic process that converts system requirements with MANPRINT implications (and by this point in the development, these should be explicitly identified as MANPRINT requirements) into specific actions required of contractor personnel and specific characteristics to be exhibited in the hardware and software produced by the contractor. It is helpful to think in terms of the deliverables such as the hardware, software, technical publications, etc., in light of each of the six MANPRINT domains. These domains should be evaluated from the perspective of operations, maintenance, and support, considering in turn the individual soldier, the crew, and the unit. The MANPRINT process demands "system thinking" of the broadest and most comprehensive type. In preparing RFP clauses, never lose sight of the fact that MANPRINT is an *integration* effort to assure system effectiveness (see Figure 1). The preparation of RFP MANPRINT clauses begins with a thorough review of the ROC for MANPRINT requirements. In ROC documents written after MANPRINT was implemented Army-wide, paragraph 8, MANPRINT and paragraph 5,

Operational Characteristics, are the places to begin. Paragraph 8 contains explicit MANPRINT requirements arranged by domain, while Paragraph 5 may contain implicit MANPRINT requirements (concerning soldier performance). In documents originating before the implementation of the program, MANPRINT is interwoven with other requirements such as ILS, and a little more effort is required to isolate and extract the MANPRINT issues. In either situation, it is helpful to examine the O&O Plan for MANPRINT matters that need to be carried forward into the RFP.

The balance of this chapter occasionally contains illustrative examples of MANPRINT requirements couched in terms suitable for an RFP. It must be emphasized that these paragraphs are *Illustrative*. They show, in general, how the MANPRINT requirements for major, complex materiel (a tank or an aircraft) might be organized and expressed. While they are realistic, they are neither all-inclusive nor totally applicable to *every* RFP. They should not be directly copied but should be thoughtfully selected and adapted to the MANPRINT needs of the materiel being procured, as has been done in the example RFP in Chapter 4.

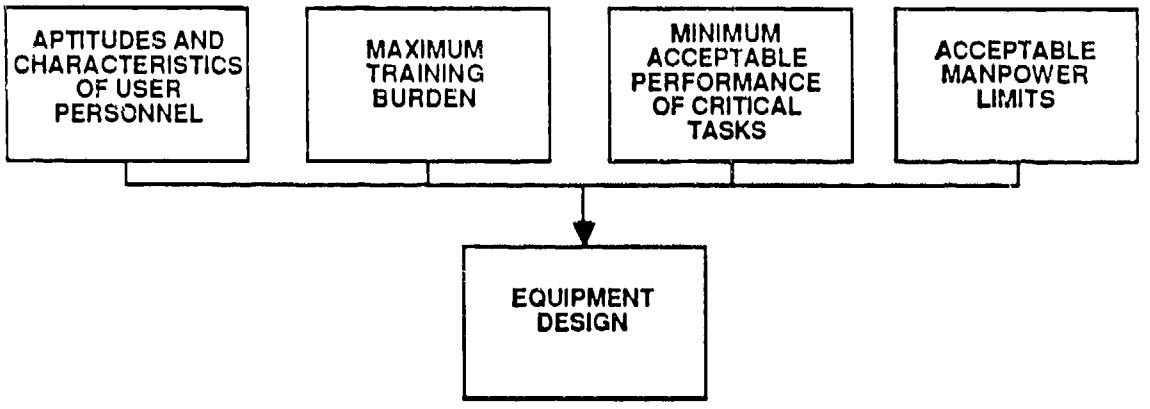

FIGURE 4
MANPRINT REQUIREMENTS AFFECTING OPTIMUM SYSTEM DESIGN

3.2.1 **Converting ROC Statements to RFP Requirements.** Where the requirements document (e.g., a ROC prepared by TRADOC) has been

prepared in accordance with AR 71-9 and AMC/TRADOC Pamphlet 70-2, this is a relatively simple process. The requirements document will contain four essentials illustrated in the upper portion of Figure 4. The RFP drafter then incorporates those essential MANPRINT constraints in appropriate portions of the RFP (as explained below). Organizational constraints or requirements must also be identified and the information presented in the RFP. However, where any one of those essentials is missing from the requirements document (as is frequently the case in ROCs produced before promulgation of the MANPRINT program), the RFP drafter needs to refer to paragraph 3.2.4 of this document to learn how to produce the missing essentials.

a. Soldier Identification. Either the TAD or a replacement for the aptitude portion (as explained in paragraph 3.2.4 below) should be included in the personnel subsection of the System Specification.

b. Training Burden. Either the TRADOC-developed training burden (in time and cost dimensions) or a replacement statement (developed as explained in paragraph 3.2.4 below) should be included in the training subsection of the System Specification.

c. Soldier Performance Standards. Either the existing standards drawn directly from the requirements document or standards derived from analysis and interpolation of whatever system performance requirements do exist (as explained in paragraph 3.2.4 below) should be written into the performance characteristics section of the System Specification.

d. Manpower Limits. The limitations and requirements for the organizational structure to which the equipment will be assigned will be found in the organizational section of the ROC and O&O Plan. That information should be referenced in that portion of the scope of work which requires the contractor to determine the most cost-effective organization(s) for manning the system.

3.2.2 **ROC Paragraph 8, MANPRINT and ROC Paragraph 5, Operational Characteristics.** The RFP drafter should begin with paragraph 8, as this is the central source of MANPRINT requirements information. In a well-written ROC, this section will contain the four MANPRINT elements shown in the top portion of Figure 4. Examine this section in detail and include in the RFP those MANPRINT requirements that the contractor needs to address. For example, paragraph 8 should have a manpower/force structure assessment which estimates manpower requirements per system, per unit and the total Army (Active, ARNG, and USAR). In addition, examine this section in detail and separate items that are solely Army responsibility from those that the contractor needs to address, and include the latter in the RFP. (For example, an assessment to reduce manpower requirements by Army component is strictly an Army issue which should not affect the contractor. However, if increases in force structure are required, those

increases are likely to affect the contractor's work and should, therefore, be included in the RFP.) Also include any government furnished information that the contractor will need in fulfilling contract requirements, such as the TAD. In most cases the requirements of Paragraph 8 can be transferred directly into the RFP using the illustrations that appear later in this chapter and the RFP example in Chapter 4 as guides.

In ROC Paragraph 5, look for system performance requirements (effectiveness and availability) which have direct impact on MANPRINT. Also determine if there are soldier-machine interface (SMI) issues in this section. SMI impacts on the manpower, personnel, and training domains as well, making it a good place to start. Keep in mind that most Army materiel must be operable and maintainable by both male and female soldiers. Look for the workload and task difficulty placed on the soldier. These can influence crew size, personnel skill levels, and training resources required. Information and communication interfaces also are highly important. Information is useful to the soldier only if it is visible, audible, legible, or intelligible and then only if it is comprehensible. This applies to information from machine to soldier and from soldier to soldier. The MANPRINT requirements derived can be converted into RFP requirements following the examples appearing later in this Chapter and the RFP example of chapter 4.

3.2.3 **Considering Other MANPRINT Requirements Sources.** As noted, many activities will have taken place by the time the RFP drafting is begun. However, the RFP may have to be constructed while some of the supporting documents are being written by other agencies. The RFP drafter may find it necessary to use draft versions of these supporting documents during preparation of the RFP. The ROC and the O&O Plan are prime sources of MANPRINT input into the RFP. If the ROC or O&O Plan have not yet been prepared or are inadequate in the MANPRINT area, the HFEA may provide the needed coverage. The HFEA is usually a fertile source of MANPRINT issues, some of which may need to be translated into contractual requirements. Additionally, the ILS Manager may be able to offer information on manpower, personnel, training, and safety which may be available from a LSA in an earlier phase of the materiel acquisition process.

3.2.4 **Bridging Gaps in MANPRINT Requirements.** For MANPRINT requirements to be effective in influencing the design of system hardware and software, all four of the essential components identified earlier must be evident: (1) identification of the aptitudes of the soldiers who are projected to be the system operators and maintainers, (2) statement of the maximum training burden (in terms of time and cost) that the Army can bear for the new system, (3) statement of the minimum acceptable performance expected from the soldier-machine system, and (4) statements of any manpower or organizational limitations and requirements for the most cost

efficient use of manpower. If any one of those four parts is missing, the system designer (contractor) is offered an escape from what is intended to be the responsibility of his design team for the ultimate performance of the soldier-machine system in the field with Army troops. Consequently, where any of the first four essential MANPRINT requirements shown in Figure 5 are missing, they must be created and included in the appropriate place in the RFP.

a. Manpower Limitations. If manpower constraints are missing from the O&O Plan and the ROC, the RFP drafter should check to see if a HARDMAN analysis was conducted earlier. Findings from such analyses are helpful in creating the manpower constraints needed for the RFP. In the absence of HARDMAN information, the RFP drafter should require in the SOW that the contractor develop a structure which includes operations, maintenance, and support elements that will support the system mission. At a minimum, the structure evaluated should be at a level that contains operator, maintenance and support considerations for that item of equipment. Analyses of minimal organizational structures should be conducted and the results traded-off with training cost and overall cost to the Army.

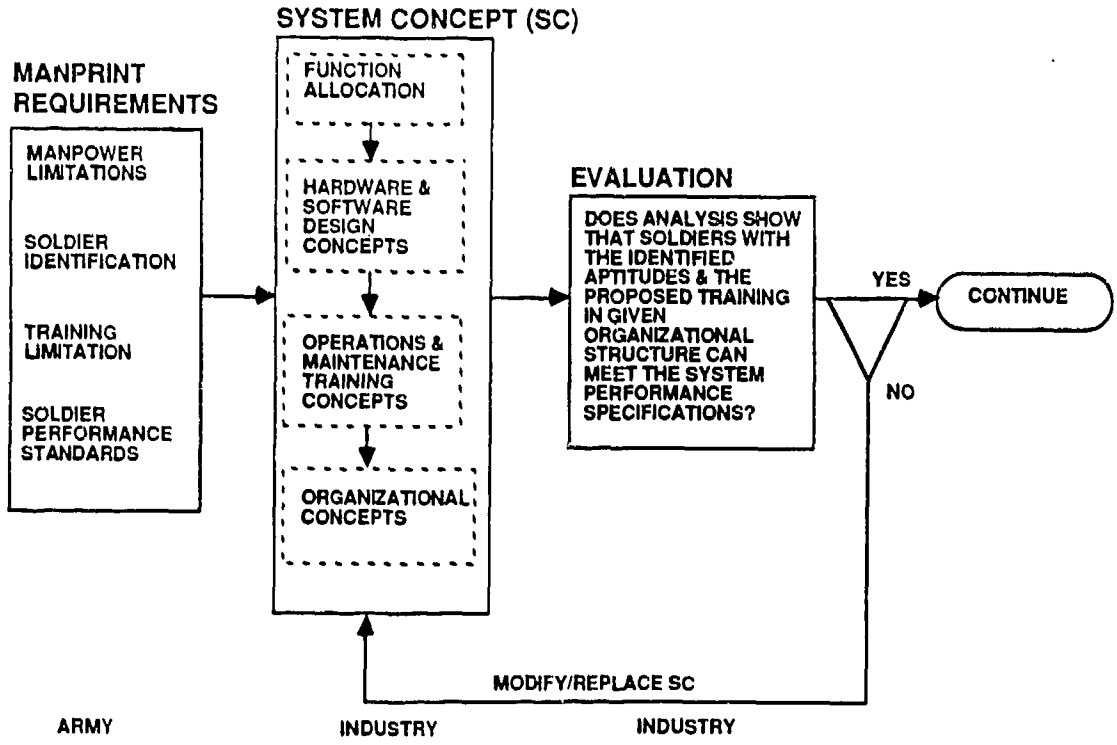

FIGURE 5
HOW MANPRINT REQUIREMENTS AFFECT INITIAL DESIGN CONCEPTS

b. Characteristics of User Personnel. If the Target Audience Description is missing, soldier aptitude requirements for inclusion in the RFP can be created by identifying the MOS of the personnel forecasted as operators and maintainers, and then noting the minimum "qualifying score" on the Armed Services Vocational Aptitude Battery (ASVAB) subtests that determine each MOS. The aptitude range for each personnel position can be determined by calculating the lowest 20% of aptitude scores in that MOS.

c. Maximum Training Burden. Statement of this burden presupposes that the TRADOC combat developer who originated the requirements document has inventoried the training resources his center has available (considering all of the institutional training which must be supported for all of the systems for which that school is the proponent) and has carefully calculated what could be made available for the new system. In similar fashion unit traning demands in terms of time, supplies, devices and facilities must be assessed against available resources. For example, the Army Reserve and National Guard have a limited number of training days per year (37 and 38 days respectively); if the training requirement exceeds available days, then their training readiness will suffer. How many training days does an active Army unit have after subtracting time for exercises, ARTEP's, maintenance, and local command requirements? Will the sustainment training requirement fit in the available training box? If not what are the alternatives if training readiness is to be maintained? Where no such calculation has been made, the RFP drafter can calculate a rough equivalent by determining the time and cost of both institutional and unit training for the system which will be replaced by the system about to be acquired. Where a predecessor system exists, the training time required to support it can be used as a rough baseline and a requirement not to exceed or to reduce that time might be included in the RFP. Since TRADOC will normally have an opportunity to comment on the completed first draft of the RFP, TRADOC will have an opportunity to correct any errors in such an approximation of the training burden.

d. Soldier Performance Standards.

(1) Different combinations of aptitude and training can produce the same relatively consistent soldier performance. Since acquiring high-aptitude personnel or training low-aptitude personnel costs the Army money, there is a natural trade-off *which the Army wants the contractor's design team to make* between the use of high-aptitude personnel and the need to provide excessive training for low-aptitude personnel. The contractor cannot make that trade-off (Figure 6) unless he knows what level of performance is minimally acceptable.

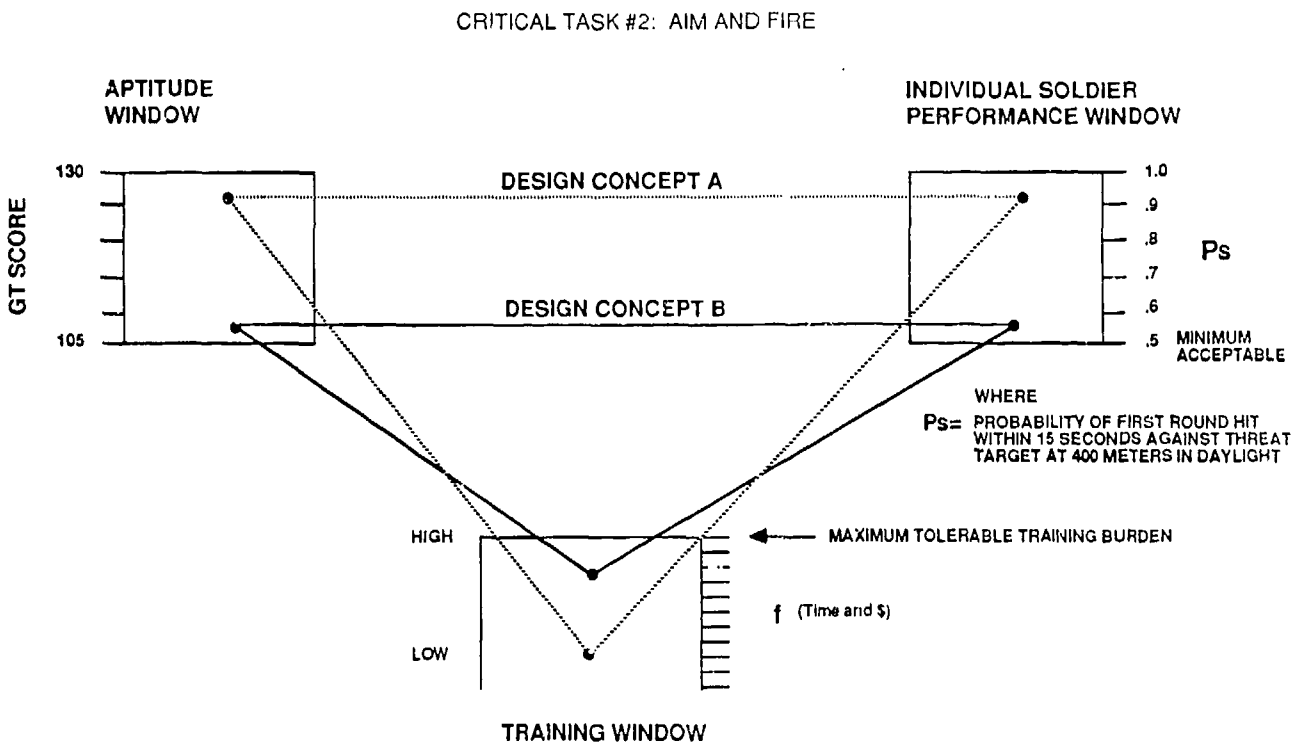

FIGURE 6
EXAMPLE OF APTITUDE, TRAINING, AND SOLDIER PERFORMANCE TRADE-OFF

(2) Soldier performance standards can be developed analytically from system performance specifications (as explained in detail in Reference 87). The RFP drafter needs to determine the "minimum acceptable performance" value shown in Figure 6 in order for the contractor to be able later to perform the trade-off illustrated in that figure. Even where the requirements document may be ambiguous on some system performance requirements, the analytic process that is necessary to determine minimum acceptable soldier performance can be accomplished by:

(a) identifying the system missions and stating them in terms of actions to be performed (Appendix A of Reference 88).

(b) analyzing those actions in terms of the functions to be performed by the hardware, software, and soldiers (Appendix B of Reference 88).

(c) determining the critical soldier tasks for operations, maintenance, and support of the system (Appendices C and D of Reference 88).

(d) calculating the time and accuracy requirements of each critical task based on the overall system performance requirements and (if available) the system error budget.

3.2.5 **RFP Coordination.** From the MANPRINT viewpoint, it is important that the draft RFP be coordinated with the System MANPRINT Manager, if one has been designated; the MJWG, the TRADOC System Manager, and the ILS Manager. In the absence of a System MANPRINT Manager, coordination should be made with the System ILS Manager. (Note: Within AMC the ILS Manager is usually designated the MANPRINT Manager.) In the absence of a MJWG, coordination should be made with appropriate agencies selected from among those listed in Chapter 2.

3.3 **MANPRINT in the RFP Structure.** The primary task of an RFP drafter is to convey to industry what it is that the government wishes to procure. Two skills are required: first, mastering the many technological areas that must be covered in the RFP for a major system and, second, understanding the laws, regulations, and policies that govern RFP format and content. Few individuals are experts in both. Consequently, this handbook has been prepared to assist technological experts in communicating with procurement specialists in preparing an RFP. It is important for the technological expert to understand that an RFP has a reasonably standard format that enables industry to develop competence in reading and interpreting RFPs. A new technology (like MANPRINT) does not obviate the need for its practitioners to learn the well-established rules for communicating with industry. In particular, it is important for the MANPRINT expert to realize that there is not just a single place in the RFP where MANPRINT matters should be included, but at least six:

a. **The Executive Summary** transmits to senior industry personnel the major importance and emphasis the Army attaches to MANPRINT. This is most effectively accomplished by summarizing the impact MANPRINT issues will have in the source selection process.

b. **The Statement of Work (SOW)** states what the Army wants the contractor to do (i.e., task statements) in developing the system. It describes both the deliverables to be provided under contract and the work to be done to assure that the developed system performs as specified.

c. **The System Specification** describes how the system is supposed to look and act (in Section 3, System Specification) and how these specified looks and actions are to be verified (in Section 4, System Specification).

d. **The Contract Data Requirements List (CDRL)** explains to an offeror what information (often typed reports) the contractor will be required to furnish to the government about the tasks being accomplished and the performance of the hardware and software being developed, how often, and in what form. The process for preparing a CDRL is complex and highly structured. In general, once the needed MANPRINT data are identified, the specific data requirements and schedule of delivery are spelled out in the RFP using DD Form 1423, "Contract Data Requirements List (CDRL)". Each data item is keyed to a tasking in the SOW or to a specification

requirement. The data must be described in terms of standardized Data Item Descriptions (DIDs) which are themselves cataloged in the Acquisition Management Systems and Data Requirements Control List (AMSDL). Reference #89 provides an excellent and highly readable explanation of the data requirements specification process.

e. **Instructions to Offerors** contains many helpful hints to an offeror trying to write a responsive proposal. These instructions often include coordination statements (e.g., that the MANPRINT and ILS programs should not be conducted in a duplicative fashion), and instructions on what specific matters must be covered in detail in the technical proposal. It describes both the deliverables to be provided under the contract and the work to be done to assure that the developed system performs as specified.

f. **Proposal Evaluation Criteria** explain to an offeror how his technical proposal will be evaluated by the Source Selection Evaluation Board (SSEB). Both technical criteria and relative importance are shown.

3.3.1 MANPRINT in the Statement of Work.

a. **General.** In an RFP written for the Development/Proveout phase, the SOW identifies the broad requirements which the Army wants the contractor to address in the development of a system. The focus is on the contractor and the language in the SOW defines the minimum required contractor efforts. A typical SOW for this phase might task the contractor to implement a MANPRINT program; to collect and analyze human performance data on equipment mockups or prototypes; to analyze results of cost, schedule and performance trade-offs or perform production planning to identify resource requirements for production; and to achieve a required level of production readiness. Technical data requirements are described using an appropriate Data Item Description, and delivery is ordered using the Contract Data Requirements List (CDRL).

b. **Specific.** Prior to writing the SOW, reference to MIL-HDBK-245, *Preparation of Statement of Work (SOW)*, would be useful in understanding the framework of the SOW and providing guidelines on tailoring SOW statements to complement statements contained in the System Specification. As MIL-HDBK-245 is currently organized, MANPRINT domains appear in various areas of paragraph 3, Requirements. For a variety of reasons including cohesion, understanding, and impact, MANPRINT should appear as a single subparagraph of paragraph 3 and should be further subdivided into the six MANPRINT domains as shown in the example below. The paragraph number used in the example is arbitrary and may vary in actual practice.

(Note: Illustrations of MANPRINT applications throughout Chapter 3 are enclosed with a black border for ease of identification.)

3.8 **MANPRINT.**

3.8.1 **Planning and Execution.** An adequately staffed MANPRINT effort shall be dedicated to and be an integral part of the hardware and software analysis, design, development, and test process. A MANPRINT program limited to ex post factor review is not acceptable. Accordingly, a MANPRINT Program shall be planned and executed to meet the Development/Proveout objectives, characteristics and constraints set forth below and in the System Specification. The program shall effectively integrate the MANPRINT domains with one another, with the ILS and Quality Assurance Programs, and with the design process.

3.8.2 **Objective.** The objective of the MANPRINT effort shall be to integrate all elements of the system involving soldier performance and safety and, based thereon, to influence system design so as to optimize total system effectiveness.

3.8.3 **Scope.** MANPRINT Program elements shall include manpower and personnel requirements, training programs, HFE, system safety considerations, and biomedical and health hazards from concept design through deployment. The emphasis of MANPRINT shall be on: (1) early recognition and resolution of soldier operational, maintenance, and support issues; (2) system performance (effectiveness and availability) to include personnel performance; and (3) fielding of a system which meets the total operational and support unit requirements. The MANPRINT Program shall be coordinated with ILS, RAM, and LSA activities to achieve an integrated overall effort without duplication.

3.8.4 **MANPRINT Program Emphasis Areas.** Within the context of the above considerations, the MANPRINT program shall include and emphasize as a minimum the following domains:

3.8.4.1 **Manpower and Personnel.** The contractor shall develop and use a manpower and personnel requirement model, to evaluate the impact of hardware design features on the manpower structure required for operation and support of the *XXXX* system. The model shall provide a means to evaluate the influence of design changes on the manpower and personnel structure. Based on task analysis (para. 3.8.4.3.2.d), the contractor shall identify the aptitudes, Military Occupational Specialties (MOS) and grade levels required for successful operation, maintenance, and support of the *XXXX* system. HARDMAN comparative analyses may be used to establish a baseline of manpower and personnel requirements of the proposed system. These data shall be available at all program reviews.

3.8.4.2 **Training.** The contractor shall (1) develop a system training package to support institutional and non-institutional training for operator, maintainer, and support personnel; (2) optimize training system effectiveness to reduce training time; (3) use the Integrated Training

System (ITS) to train TT/OT personnel to mission-ready skill levels (final acceptance of the ITS shall be contingent upon successful demonstration of training at OT); (4) conduct tradeoff analyses to determine the optimum extent of embedded training features, taking into account such factors as cost, weight, maintenance, support, institutional and unit training burden, contribution to soldier proficiency and to refresher training; (5) develop all courseware for the above.

3.8.4.3 **Human Factors Engineering.**

3.8.4.3.1 **General.** A human factors engineering effort shall be provided to achieve the required effectiveness of personnel performance during operation, maintenance, and support and to make economical demands upon manpower resources, skills, training, and costs. While a detailed human engineering plan and formal program are not required, HFE shall be a specific component of analyses, design activities, and operating and maintenance procedures throughout development and testing.

3.8.4.3.2 **Technical.** HFE shall be undertaken in accordance with paragraphs of MIL-H-46855B as applicable to full-scale engineering development of the *XXXX* system. HFE shall be integrated into the *XXXX* system and shall include but not be limited to the following:

a. Analysis of equipment and procedure design of the *XXXX* system in general and the _____ in particular.

b. Analysis of design trade-offs that affect user-system interface such as _____ .

c. Integration of human engineering design criteria and human performance requirements into soldier-machine interfaces and optimal equipment handling, placement, storage, and access.

d. Analysis of tasks required to operate, maintain, and support the *XXXX* system including, pre-operational, post-operational, and operations under all weather, threat and degraded mode conditions.

e. Integration of HFE into test planning, accomplishment, and reporting.

(Note: Paragraph 3.8.4.3 above was adapted from Reference #86.)

3.8.4.4 **System Safety.** The contractor shall conduct a system safety program (SSP) IAW Task 100, MIL-STD-882. The SSP shall integrate safety (consistent with mission requirements) into the design and qualification of the *XXXX* system including the Training Device System.

3.8.4.4.1 **SSP Management and Control.** The following MIL-STD-882 tasks and specific requirements are imposed to ensure adequate management and control of the SSP.

Task 101 SSP

Task 103 System Safety Reviews. System Safety shall be an agenda item at all design and program reviews. A risk assessment of any unresolved deficiencies identified in the *XXXX* system with respect to safety shall be presented along with guidance for corrective or controlling action. Contractor shall conduct quarterly SSP Reviews (combined with quarterly technical reviews) to assess the status of compliance with the program requirements. Reviews shall include: (a) Review of program progress and compliance with major safety milestones; (b) Review of newly recognized hazards (past 120 day period) and changes in the degree of control of previously identified hazards; (c) Inventory of all identified hazards tabulated by sequence number and its status: open, closed, or monitor; (d) Status of all recommended corrective actions that have not been implemented; and (e) Significant cost and schedule changes that impact the SSP effort.

Task 104 System Safety Working Group Support.

Task 105 Hazard Tracking and Risk Resolution.

Task 106 Test and Evaluation Safety.

3.8.4.4.2 **SSP Analysis, Assessment and Reports.** The following MIL-STD-882 tasks and specific requirements are imposed to ensure adequate engineering and system design.

Task 203 Subsystem Hazard Analysis.

Task 204 System Hazard Analysis.

Task 205 Operating and Support Hazard Analysis.

Task 207 Safety Verification.

Task 209 Safety Assessment.

3.8.4.4.3 **Surface Danger Area Determination.** The contractor shall determine surface danger areas, define airspace reservation requirements, and projectile trajectories. Considerations shall include both weapons and lasers. The contractor shall develop range safety recommendations.

3.8.4.4.4 **Radioactive Material.** The contractor shall prepare a listing of all radioactive material or items contained in the *XXXX* system. The list shall include the chemical composition and description, physical form, and activity of the finished item(s) in the use, maintenance, transportation and storage of the *XXXX* system or components thereof.

3.8.4.5 **Health Hazards.** The contractor shall identify all biomedical and health hazards present during the operation and support of the *XXXX* system hardware to include natural and induced hazardous environments and provide results at the System Safety Working Group (SSWG) meetings.

3.3.2 MANPRINT Inputs to the System Specification.

a. **General.** In most cases, the System Specification for a major Army system will have been prepared in accordance with MIL-STD-490, Specification Practices. MIL-STD-490 is, at this writing, in its "A" revision (dated 4 June 1985), and a "B" revision is now being prepared. MIL-STD-490 is a DoD document, with the Air Force Systems Command as proponent. As MIL-STD-490A is currently organized, the six MANPRINT domains are scattered throughout the document. (One early draft of MIL-STD-490B groups the MANPRINT domains together, vastly simplifying the preparation of input to a system specification.)

b. **Specific.** Before attempting to prepare MANPRINT inputs to a system specification, the writer needs to verify *which* revision of MIL-STD-490 is being used as the blueprint for that specification. For the "A" revision, MANPRINT inputs should be made to the following paragraphs:

(1) **Paragraph 3.2.1 Performance Characteristics.** This paragraph becomes the figurative anchor for all subsequent MANPRINT input to the system specification by establishing that (1) a "manned system" is being developed and that the soldiers who will operate, maintain, and support the system have already been identified; (2) soldier performance is to be considered in calculating system performance (effectiveness and availability); and (3) there may be certain soldier performance standards which must be achievable in the fielded system. A good example of a performance specification suitable for inclusion in this paragraph is shown here:

3.2.1 **Performance Characteristics.** The design of the system shall provide a soldier-machine interface (SMI) which allows the "ready" XM99, operated by soldiers identified in the target audience description with no more skill attainment/sustainment training than described below, to engage a stationary threat system at 1/2 maximum range of the XM99 within 15 seconds after detection with 7 kilometer visibility in a benign countermeasures environment. Engagement time of 23 seconds after target identification is desired under NBC, night, and/or other adverse conditions. The hit probability (P_h) for such an engagement shall be at least .87 when calculated by an equation/formula containing one or more specific terms describing the soldier performance of critical operations tasks. P_h of at least .71 is desired under NBC, night, and/or other adverse conditions. Until test data are available for use in this calculation, a value not to exceed .9 may be substituted for any such term.

(2) **Paragraph 3.2.2 Physical Characteristics.** This paragraph shall state any physical characteristics of the system hardware that are of particular concern to the MANPRINT program. Among the characteristics often covered in this paragraph are weight, size, portage (including disassembly and component handling), equipment actions and energy types and levels to be controlled, NBC provisions, ingress/egress, and access provisions. An example is:

> 3.2.2 **Physical Characteristics.**
>
> 3.2.2.1 **Weight.** The system hardware which includes an antenna unit, a power unit (or interface to host vehicle power), a reviewer processor unit and a control display unit and other components required to keep the system in continuous operation for at least eight hours, shall weigh 22.5 kg or less (desired) to 30.0 kg (required/maximum).
>
> 3.2.2.2 **Configuration.** The physical shape of the hardware shall be compatible with suitably clothed and equipped user-population. The systems shape and weight shall be in conformance with paragraph 5.11 of MIL-STD-1472.
>
> 3.2.2.3 **Length.** The carry length of the largest hardware component shall not exceed 50 centimeters with 40 centimeters desired.
>
> 3.2.2.4 **Health and Safety.** The design of hardware components shall be conform to the health and safety requirements of paragraph 5.13 of MIL-STD-1472 and paragraphs 5.1 and 5.2 of MIL-STD-1474.
>
> 3.2.2.5 **Chemical Agents/Paints/Deterioration Control.** The hardware components shall be designed to resist chemical agents, to facilitate chemical decontamination and to afford protection from corrosion and deterioration.
>
> 3.2.2.6 **Portability.** The hardware components shall be designed to separate into man-portable loads, each with its own back-pack for long distance carrying. Components shall have the capability for rapid movement carry. The design shall be in accordance with paragraph 5.11 of MIL-STD-1472.

(3) **Paragraph 3.3.6 Safety.** This paragraph shall contain the health and safety provisions applicable to the system for minimizing the risks to personnel of mechanical hazards and exposure to poisons, toxic gases, extreme temperatures, and radioactive substances. An example is:

> 3.3.6 **Biomedical, Health Hazard, and Safety Assessment.** The system hardware shall incorporate safety features to protect operator and maintenance personnel, facilities, and the item itself during operation, maintenance and storage. System design shall be in conformance with the health and safety requirements of paragraph 5.13 of MIL-STD-1472 and paragraphs 5.1 and 5.2 of MIL-STD-1474.

(4) **Paragraph 3.3.7 Human Engineering Program (HEP).** Human engineering requirements for the system shall be specified here and applicable documents (e.g., MIL-STD-1472) included by reference. This paragraph should also specify any special or unique requirements (e.g., constraints on allocation of functions to personnel and communications and personnel/equipment interactions). Included should be those specific areas, stations, or equipment which require concentrated human engineering attention due to the sensitivity of the operation or criticality of the task (i.e., those areas where the effects of human error would be particularly serious). An example is:

> 3.3.7 **Human Engineering Program (HEP).** Design, selection, and arrangement of equipment shall be such as to ensure ease, efficiency, and safety of operation in performance of all necessary functions by operational and maintenance personnel. The human factors engineering data requirements of paragraphs 5.4, 5.5, 5.6, 5.9 and 5.13 of MIL-STD-1472 shall apply.
>
> 3.3.7.1 **Operator Task Development.** Human engineering principles and criteria shall be applied in developing an optimum arrangement of operator tasks and subtasks. Particular attention will be paid to any requirements for multiple sequential actions (in terms of number of simultaneous tasks or task complexity) which might result in a potential for catastrophic failure of the system.

(5) **Paragraph 3.6 Manpower, Personnel, and Training.** The original parameters of this paragraph have been expanded to include the manpower domain of MANPRINT. Requirements stated in this paragraph are the basis for ultimate determination of system MPT requirements. Requirements include but are not limited to the total number of personnel that may be allocated to the system; number and types of operational crew personnel; other organizational limitations; the aptitude constraints for soldiers projected to operate, maintain, and support the system; and the maximum training burden that the Army can tolerate in operating and maintaining the system. The requirement to consider embedded training as the preferred alternative shall be explicitly stated. An example is:

> 3.6 **Manpower, Personnel, and Training.**
>
> 3.6.1 **Manpower.** There shall be no new MOS or personnel requirements generated above current unit TOE/TDA authorizations for the *XXXX* system that is to be replaced. Current *XXXX* system requirements are as follows:
>
> a. MOS: MOSC 11B10, 11B20, 11B30, 11B40, and 11B50
> b. Force Structure:

Grade	Skill Level	Authorized
E3-E4	SL1	15,648
E5	SL2	4,225
E6	SL3	3,756
E7	SL4	2,034
E8-E9	SL4	1,408

3.6.1.1 **Crew Size.** Maximum operational crew size shall not exceed two (2) soldiers, including an operator and an assistant operator. In emergencies, the system shall be fully operable by one soldier for not less than a continuous four (4) hour period.

3.6.1.2 **Maintenance Tasks.** Maintenance tasks shall decrease by 10% from the 39 tasks required by the current *XXXX* system. No maintenance task shall require more than one soldier. Maintenance tasks shall not result in manpower increases at the Unit and Intermediate levels.

3.6.2 **Personnel.** The Target Audience Description (see Section J) lists the expected aptitude levels (ASVAB scores) of soldiers who have been identified as the likely operators and maintainers of the *XXXX* system hardware.

3.6.2.1 **Cognitive and Physical Requirements.** The system performance cited in paragraph 3.2.1 of this specification shall be achievable by soldiers whose ASVAB scores are in the lowest 20th percentile of the scores authorized for each MOS. They shall have a physical profile at least 111221 as defined by AR 40-501.

3.6.2.2 **Maintenance Workload.** The *XXXX* system hardware shall be maintainable to the degree cited in paragraph of this specification by personnel holding MOS XX with OF/EL scores of 100. It is desirable that maintenance tasks be simplified so that those maintenance standards can also be achieved by personnel holding MOS XX with OF/EL scores of 85.

3.6.3 **Training.** Training programs and equipment shall be designed to permit a fully-trained gunner to correctly perform the tasks required to fire a round 95 percent of the time. A fully-trained gunner is defined as a soldier who has attended an initial operator training program not to exceed 48 hours duration in order to achieve an initial proficiency and who has subsequently had not less than six nor more than ten hours/quarter retraining in order to retain that initial level of proficiency. Embedded training (ET) shall be the first training alternative considered.

3.6.3.1 **Training Modes.**

3.6.3.1.1 **Factory Training.** Factory-conducted training programs shall (1) provide factory training for government personnel to meet TT/OT requirements based on latest system configuration (production prototype, not engineering prototype ITS), (2) provide, maintain, support, and deliver all training hardware, software, and courseware required to conduct factory training, (3) include staff planner courses during Development/Proveout, and (4) provide each student a training package (i.e., appropriate courseware and study materials).

3.6.3.1.2 **Institutional Training** shall: (1) qualify both initial entry and trained in-service personnel for all operator, maintainer, and support designations; (2) provide for a 25-percent student surge capability; (3) use the systematic group-paced approach in accordance with TRADOC Reg 350-17.

3.6.3.1.3 **Non-Institutional Training** shall: (1) support operator, maintainer, and support sustainment training that is task oriented for each skill level; (2) provide sustainment training to maintain operator, maintainer, and support proficiency in infrequently performed tasks, especially for low-density MOS. Sustainment training shall be based on a skill retention analysis.

3.6.3.2 **Training Device Systems.**

3.6.3.2.1 **Training Devices.** Training devices shall be based on and exhibit traceable, hierarchical relationships to the operator, maintainer, and support tasks (individual and collective) for which each individual device will train. Multiple use of a device or different devices for collective training or for instructor use shall be provided where appropriate.

3.6.3.2.2 **Hardware Requirements.** Training devices shall replicate *XXXX* system hardware in configuration, function, and performance to the degree of fidelity necessary to train operator, maintainer and support functions, tasks, and skills to the level of proficiency specified in government-developed evaluation criteria, (i.e., ARTEP, ATM, ITEP, STP, SQT). Devices shall produce positive training transfer. Growth potential for training equipment shall functionally match growth potential in fielded equipment. The design of training devices shall optimize cost, training, and MANPRINT effectiveness.

3.6.4 **MPT vs. System Design Sensitivity.** Alternative system design solutions shall analyze the impact of design variations upon MPT requirements. Designs that require an increase in manpower authorizations (operator/maintainer/support personnel) above the level required by the system to be replaced will be rejected from further consideration.

3.6.5 **Task Analysis.** A task analysis shall document the operational, maintenance and support manpower and personnel requirements and the task time- line analysis to include operations under all weather, threat and degraded mode conditions. Critical tasks proposed for automation shall be accompanied with a detailed rationale setting forth the increase in performance effectiveness expected to be realized. Analytical efforts shall be iterated as operator, maintainer, and support personnel performance data are derived and validated during development and test.

(6) **Paragraph 4.1.2 Special Tests and Examinations.** The MANPRINT-specific tests proposed for the system (including system technical testing and projected operational testing) should be described in this paragraph. The effectiveness of MANPRINT in an RFP and in the subsequent contract depends almost entirely on the quality of MANPRINT test and evaluation (T&E) requirements. The RFP should motivate the offerors to consider the six MANPRINT domains in preparing their proposals. The subsequent contract should state legally-enforceable contract requirements to: (1) perform MANPRINT tasks, (2) build MANPRINT characteristics into the hardware and software being developed, and (3) report on both of the above. Clearly the incentive to do MANPRINT work is directly related to its visibility at the end of the contract. Army Regulation 602-2 requires (in paragraph 2-12) that soldier performance data (on critical operations and maintenance tasks) be collected and included in any calculations of system effectiveness and availability which are presented at ASARC reviews. This portion of the RFP should reflect the provisions of that regulation by requiring the contractor to collect and report (via DI-H-7058) early human performance data. Where the Army has already developed equations for assessing the system being acquired, the contractor should also be required to report periodically on both the effectiveness and availability of the developing system by showing the results of such calculations when human performance data are included. If the Army has not yet developed a scheme for measuring system performance and availability by the time the RFP is to be released, offerors should be advised to propose their own quantitative scoring concepts, with equations that systematically consider soldier performance of critical operations and maintenance tasks. In this instance, Reference 87 will be especially helpful to an RFP drafter.

3.3.3 MANPRINT in the CDRL.

a. Purpose: The RFP SOW explains to the offeror what tasks need to be performed by the contractor. The CDRL on DD Form 1423 identifies for the offeror what written reports and other deliverable data the contractor will be required to submit concerning those tasks. The format and content for each such report are contained in a DID on DD Form 1664 (not included in this handbook). In preparing the DD Form 1423, the goal is to limit information to that actually required for the specific procurement.

Information requirements are minimized by "tailoring" the DID (i.e., lining out on the face of the DD Form 1664 those requirements which are unnecessary in this particular procurement). Reference 89, written from the human engineering point of view, is an excellent guide to the process of selecting Data Item Descriptions for an RFP and describing them correctly on a DD Form 1423.

b. Selecting MANPRINT DIDs: Listed in Table 1 are some of the most common MANPRINT-related DIDs authorized for use in DoD acquisition programs by the AMSDL dated April, 1986. [Changes to the AMSDL are distributed every six months, and several specifications and standards linked to manpower, personnel, and training are currently under revision. Consequently, it is assumed that several of the DIDs now listed in Table 1 will be changed in the near future.] DIDs should be selected from this list (which is not all-inclusive) based on the Army's actual need for information from the contractor, not on the content of a CDRL used in a prior procurement. Because many of the DIDs listed in Table 1 were in existence before the MANPRINT Program was announced, several individual DIDs cover more than one of the six MANPRINT areas (and therefore appear more than once in Table 1). Such DIDs should be given priority for selection, since their use facilitates the *integration* of the six MANPRINT domains.

TABLE 1

MANPRINT-Related Authorized Data Item Descriptions

A. MANPOWER

Number	Title
DI-ILSS-80077	Manpower, Personnel, and Training Analysis Report
DI-ILSS-80114	Logistic Support Analysis Record (LSAR) Data

B. PERSONNEL

Number	Title
DI-H-1300	Personnel and Training Requirements
DI-H-7058	Human Engineering Test Report
DI-H-7068	Task and Skill Analysis Report
DI-H-7091	Personnel Performance Profiles
DI-H-25713B	Task Listings Report
DI-H-33059	Qualitative and Quantitative Personnel Information
DI-HFAC-80243	Personnel Planning Report
DI-ILSS-80078	Personnel Performance Profiles
DI-ILSS-80115	LSA-015, Sequential Task Description Report
DI-S-3606	Personnel Trade-Off Analysis Report

C. TRAINING

Number	Title
DI-H-1300	Personnel and Training Requirements
DI-H-10010	Common Training Analysis Base
DI-H-3258A	Training Support Data
DI-M-6152A	Manuals, Operation and Maintenance Instruction, Maintenance Training Equipment
DI-H-7066	Training and Training Equipment Plan
DI-H-7067	Training Course Proposal
DI-H-7069	Training Course/Curriculum Outlines
DI-H-7072	Audiovisual Aids, Master Reproducibles, and Review Copies for Training Equipment and Training Courses
DI-H-7076	Instructor's Utilization Handbook for Simulation Equipment
DI-H-7090	Training Path System Documentation
DI-H-25711B	Training Development and Support Plan Report
DI-H-25713B	Task Listings Report
DI-H-25718B	Trainer Functional Description Report
DI-H-25721B	Training Support Requirements Report
DI-H-25724B	Student Training Materials
DI-H-25728B	Instructor Training Course Materials
DI-H-25774B	Training Program Work Report
DI-ILSS-80047	Training Course Standards

TABLE 1 (continued)

DI-ILSS-80076	Training Program and Training Equipment Plan
DI-ILSS-80077	Manpower, Personnel,and Training Analysis Report
DI-ILSS-80084	Training Material Outline
DI-ILSS-80143	Training Plan

D. HUMAN FACTORS ENGINEERING

Number	Title
DI-H-7051	Human Engineering Program Plan
DI-H-7052	Human Engineering Dynamic Simulation Plan
DI-H-7053	Human Engineering Test Plan
DI-H-7054	Human Engineering System Analysis Report
DI-H-7055	Critical Task Analysis Report
DI-H-7056	Human Engineering Design Approach Document--Operator
DI-H-7057	Human Engineering Design Approach Document--Maintainer
DI-H-7058	Human Engineering Test Report
DI-H-7059	Human Engineering Progress Report
DI-HFAC-80241	Human Factors Technical Report
DI-HFAC-80242	Human Factors Design Analysis Report
DI-H-80241	Human Factors Technical Report
Di-H-80242	Human Factors Design Analysis Report
UDI-H-20002A	Report, Design Review

E. SYSTEM SAFETY

Number	Title
DI-H-1321B	Explosive Hazard Classification Data
DI-H-1329A	Accident/Incident Report
DI-H-1336	Noise Measurement Report
DI-S-1838	Standard Operating Procedures for Hazardous Materials
DI-SAFT-80100	System Safety Program Plan
DI-SAFT-80101	System Safety Hazard Analysis Report
DI-SAFT-80102	Safety Assessment Report
DI-SAFT-80103	Engineering Change Proposal System Safety Report
DI-SAFT-80104	Waiver or Deviation System Safety Report
DI-SAFT-80105	System Safety Program Progress Report

F. HEALTH HAZARDS

Number	Title
DI-SAFT-80106	Occupational Health Hazard Assessment Report
DI-MISC-80123	Medical and Health Plan

3.3.4 **MANPRINT Paragraph in the Instructions to Offerors.** The section of the RFP will typically include a subsection on Instructions for Proposal Preparation. MANPRINT also contributes to this subsection. The following illustrative instructions are based on a major notional system:

L.1 **MANPRINT.** The MANPRINT Program Plan shall address each of the six MANPRINT domains, their integration and the integration of MANPRINT into system development. The offeror shall submit a MANPRINT Program Plan detailing the approach to satisfy the requirements of the System Specification.

This MANPRINT Program Plan shall include a list of demonstrations, test plans and reports and their schedule of accomplishment. The offeror, as part of the MANPRINT Program Plan, shall provide a Human Engineering Program Plan (HEPP) using DI-H-7051 as a guideline. The following, as a minimum, shall be included as separate MANPRINT Program Plan sections:

L.1.1 Proposed MANPRINT organization and number and qualifications of personnel assigned to conduct all MANPRINT functions. The plan shall identify the MANPRINT management structure and the lines of communication and approval within the MANPRINT program and with design engineering.

L.1.2 Detailed description of how the offeror intends to incorporate HFE design principles, including software and hardware integration efforts, for system operation and maintenance. HFE issues, procedures, and documents proposed for utilization in trade-off analyses must be identified.

L.1.3 Proposed program for assessing biomedical and health hazards and the integration of recommended corrective action with the System Safety Program.

L.1.4 Description of method to be used in determining numbers of personnel and aptitudes required for system operation and maintenance.

L.1.5 Integrated Training System Plan (ITSP) shall describe in detail the contractor approach to satisfying System Specification requirements. It shall address: (1) task analysis methodology; (2) job analysis to be applied to each proposed MOS, ASI, SC, SSI, and SQI; (3) method used to identify aptitude-sensitive critical tasks; (4) method to derive instructional techniques to overcome learning difficulties; (5) skill retention analysis method used in determining type and frequency of sustainment training; (6) embedded training features and tasks trained; (7) statement of qualifications, experience, and availability of key training development/instructor personnel in job analysis, task analysis, and curriculum

development; (8) student surge training capability (peacetime); (9) course evaluation methodology; (10) plan/schedule for validation of the ITS ensuring adequate time for government verification using validated manuals prior to TT/OT; (11) procedure for timely ITS updates; (12) milestone schedules for total ITS efforts including STP delivery.

L.1.6 Training Device System (TDS) Plan shall describe the TDS in accordance with the appropriate paragraphs of the System Specification. The plan shall address: (1) the training device (2) training device substantiating data, and (3) associated training device management and support programs.

L.1.7 The MANPRINT Program Plan shall show the coordination of the MANPRINT program with ILS, RAM, and LSA activities to achieve an integrated overall effort without duplication. The plan should provide for and show how these several efforts will be supported by a common soldier performance data base and non-duplicative systems analyses.

3.3.5 MANPRINT Proposal Evaluation Criteria.

a. This section of the RFP informs the offeror of the specific factors upon which the evaluation of his proposal will be based. These factors are tailored to cover what the government considers important for the attainment of specific program objectives. The following is one example of an *Evaluation Factors for Award* section of an RFP:

M.1 **Basic for Award.** Program contract award shall be based on the results of a complete Government evaluation in accordance with this section and shall be made to the offeror whose proposal is evaluated as offering the optimum approach for the attainment of program objectives considering Technical, MANPRINT, Integrated Logistic Support, Life-Cycle Cost, and Management factors.

M.2 **Evaluation Approach.** Proposal evaluation will be divided into five areas. In order of importance, these areas are: (1) Technical; (2) MANPRINT; (3) Integrated Logistical Support; (4) Life-Cycle Cost; and (5) Management.

b. Each major evaluation area is then subdivided into elements for a more detailed discussion of the evaluation against selected technical criteria. The MANPRINT area in the preceding example would look like this:

M.2.2 **MANPRINT (Manpower, Personnel, Training, Human Factors Engineering, System Safety, and Health Hazards Assessment.** MANPRINT shall be evaluated in three stages. First, application of management criteria will focus on the offeror's initial competence in

carrying out a MANPRINT program. Second, domain criteria will examine the six traditional domains separately. Finally, systems integration criteria will look at the system as a whole and examine its subsystem interactions and relations to higher-level goals.

M.2.2.1 **Management.** Evaluation criteria for this element in decreasing order of importance shall be Offeror's (a) concept for incorporating MANPRINT into system design, (b) Proposed MANPRINT Organization, (c) concept for the MANPRINT Program Plan, (d) MANPRINT personnel, and (e) cost.

a. **Concept for Incorporating MANPRINT into System Design.** The adequacy of offeror's concept for assuring that the system design will reflect MANPRINT goals and constraints shall be evaluated.

b. **Proposed MANPRINT Organization.** The offeror's proposed MANPRINT organization, level of effort, lines of authority, visibility to top management and potential impact on assuring MANPRINT design influence shall be evaluated.

c. **Offeror's Concept for the MANPRINT Program Plan.** The depth and credibility of offeror's concept for developing a MANPRINT Program Plan based on requirements in the SOW shall be evaluated.

d. **MANPRINT Personnel.** The capability of the offeror's personnel (including key subcontractor personnel) for performing the MANPRINT tasks required by the SOW shall be evaluated.

e. **Cost.** The adequacy of the offeror's cost analysis in relation to MANPRINT areas outlined in the SOW shall be evaluated.

M.2.2.2 **Domains.** The six MANPRINT domains, each of equal importance and each with separate criteria, shall be evaluated as follows:

M.2.2.2.1 **Manpower.** The evaluation criteria for this domain, in decreasing order of importance shall be (a) Analyses, and (b) Understanding force structure concepts.

a. **Analyses.** The credibility and depth of detail with which the offeror proposes to conduct trade-off and sensitivity analyses and subsequently apply the results shall be evaluated.

b. **Understanding force structure concepts.** The offeror's understanding of force structure constraints and ability to analyze system impact on the current force, using appropriate outputs of ECA, HARDMAN analysis and BOIP/QQPRI data shall be evaluated.

M.2.2.2.2 **Personnel.** The evaluation criteria for this domain in decreasing order of importance shall be (a) Responsiveness to the RFP, and (b) Analyses.

a. **Responsiveness to the RFP.** The offeror's compliance with and response to the constraints and guidance provided in the SOW and the system specification shall be evaluated.

b. **Analyses.** The credibility and depth of detail with which the offeror proposes to conduct trade-off and sensitivity analyses concerning soldier aptitude requirements for operations, maintenance and support tasks and subsequently to apply the results of those analyses in hardware and software design activities shall be evaluated.

M.2.2.2.3 **Training.** The evaluation criteria for this domain in decreasing order of importance shall be (a) Analyses and (b) Training Concepts and Implementation.

a. **Analyses.** The credibility and depth of detail with which the offeror proposes to conduct trade-off and sensitivity analyses between aptitude (soldier ASVAB scores), training (time and cost), and resultant soldier performance and subsequently to apply the results of those analyses shall be evaluated. The contractor's application of trade-off analysis to save resources while maintaining unit readiness shall be evaluated.

b. **Training Concepts and Implementation.** The contractor's ability to plan, establish and implement an Integrated Training System package to support institutional and non-institutional training shall be evaluated. Offeror's analysis of system training requirements throughout the total force using ICTP, service school surveys, task analyses, and other appropriate data shall also be evaluated.

M.2.2.2.4 **Human Factors Engineering.** The evaluation criteria for this domain in decreasing order of importance shall be (a) Responsiveness to the RFP, (b) Credibility of Proposal, and (c) Management.

a. **Responsiveness to the RFP.** The contractor's compliance with and response to the constraints and guidance provided in the SOW and the system specification shall be evaluated.

b. **Credibility of Proposal.** The contractor's depth of planning, implementation of procedures, methods of controlling costs and level of detail shall be evaluated.

c. **Management.** The contractor's approach in identifying and documenting functional and physical characteristics of the system, controlling changes, and maintaining and reporting status accounting shall be evaluated.

M.2.2.2.5 **System Safety.** The criteria for System Safety evaluation are of equal importance and include (a) Identification of risk and impact, and (b) Credibility of Proposal.

a. **Identification of Risks and Impact.** The contractor's approach to identify and respond to risks in system design as they relate to system safety shall be evaluated.

b. **Credibility of Proposal.** The contractor's depth of planning and implementation of procedures shall be evaluated.

M.2.2.2.6 **Health Hazard Assessment.** The criteria for evaluation of this domain shall be of equal importance and shall consist of (a) Responsiveness to the RFP, and (b) Identification of Risks and Impact.

a. **Responsiveness to the RFP.** The contractor's compliance with and response to constraints and guidance provided in the SOW and the system specification shall be evaluated.

b. **Identification of Risks and Impact.** The contractor's approach to identify and respond to risks in system design as they relate to health hazards shall be evaluated.

M.2.2.3 **System Integration.** The criteria for an overall evaluation of MANPRINT in decreasing order of importance shall be (a) SMI, (b) Analyses, (c) Feedback, (d) Coordination, and (e) data collection.

a. **SMI.** The adequacy of the contractor's procedures for integrating man and machine within the system (e.g. relating engineering decisions to soldier performance) shall be evaluated.

b. **Analyses.** The contractor's approach using trade-off analysis and sensitivity analysis to consider design alternatives and identify performance measures among functional areas (e.g., MANPRINT vs. technical) shall be evaluated.

c. **Feedback.** The contractor's efforts to provide feedback between system design and MANPRINT analysis, particularly early in the design phase to assist resolution of problems, shall be evaluated.

d. **Coordination.** The means and procedures proposed by the contractor for coordination, sharing of data, and avoidance of duplication among ILS, RAM, and MANPRINT programs shall be evaluated.

e. **Data Collection.** The contractor's procedures for data collection and analysis commonly shared by all MANPRINT domains shall be evaluated.

CHAPTER 4

EXAMPLE OF MANPRINT IN AN RFP

This chapter introduces a fictitious weapon system called the ZAPPER as it enters the Development/Proveout phase of the materiel acquisition process. The purpose of Chapter 4 is to expand upon Chapter 3 by showing, through example, how MANPRINT requirements may be selected, modified, and organized to meet the needs of a mock "real world" system. To illustrate how MANPRINT statements are put into the RFP, the ZAPPER has been made sufficiently complex to require some ingenuity in resolving MANPRINT issues in the system. While these entries reflect the guidance of Chapter 3, they are not "cold copy" from the illustrative paragraphs of that chapter. Instead, that guidance is tailored to fit the requirements of the specific weapon. The result is an RFP example organized for development of the ZAPPER. It must be emphasized that the example is only a *partial RFP with a focus on MANPRINT entries.* Some non-MANPRINT sections are abbreviated while other sections are omitted entirely. This treatment of non-MANPRINT material is deliberate. Thus, the contractions and omissions do not indicate that this material is unimportant; but simply that the illustrative purpose of this chapter does not require its presence. Finally, while this chapter is intended specifically as a model for MANPRINT requirements in the Development/Proveout phase of a system development program, many of its parts (particularly the language used to require integration of the six MANPRINT domains with one another and all of MANPRINT with other specialty programs) are also appropriate for RFPs both earlier and later than the phase illustrated here.

For ease in identifying specific MANPRINT inclusions in an RFP, all MANPRINT entries in this example are highlighted.

DEPARTMENT OF THE ARMY
U.S. ARMY BALLISTICS COMMAND
FLINTSTONE ARSENAL, GEORGIA 68477-5411

REPLY TO
ATTENTION OF

AMCPM-Z Date

SUBJECT: Executive Summary - Request for Proposal (RFP), ZAPPER Anti-Armor Weapon System, Development/Proveout Phase

TO WHOM IT MAY CONCERN:

1. The U.S. Army is pleased to solicit your proposal for the Development/ Proveout Phase of the ZAPPER Anti-Armor Weapon System.

2. **Description:** The ZAPPER is to be a **man-portable**, anti-armor weapon system designed to be highly effective against advanced armor concepts expected to be fielded against U.S. and Allied forces in the mid-1990s. The weapon is envisioned as a simple-to-operate, easily and economically maintained, rugged and reliable infantry system. The Army will give consideration to candidates whose guidance and warhead components are modular in design and may subsequently be improved, through increased accuracy and warhead penetration capability within the specified size and weight.

3. **Acquisition Strategy:** The principal strategy for the ZAPPER Program is to emphasize competition in every phase of the program. Contractors will be required to complete all component and prototype flight testing in 26 months. It is planned to issue a RFP for the Production Phase and "Not-To-Exceed" options for the first two years of Low Rate Initial Production (LRIP) approximately 22 months after award of the Development/Proveout contract.

4. **Work to be Accomplished:** Each contractor is expected to conduct the management and engineering required to design, fabricate, and test prototypes of a ZAPPER weapon. Warhead testing will be conducted to demonstrate that the weapon will defeat range targets representing the threat armor (as described in Attachment 03). Flight tests (a minimum of 24) will be conducted under varied conditions to demonstrate system range capability, hardness to practical countermeasures, and to obtain data to support terminal aimpoint distribution, system accuracy **when fired by a gunner with the characteristics stated in the Target Audience Description (TAD)**, performance boundaries, and system survivability. The contractor is expected, as an absolute minimum, to demonstrate successful engagement

(target hit plus adequate $P_{k/s}$) of five (5) of the first nine (9) flight profiles listed in the RFP Statement of Work (SOW) paragraph 3.2.1.2.1. The successful engagement must include profiles one (1) through three (3). Target acquisition and tracking testing will be conducted to demonstrate the robustness of performance against aerosols, weather, and other system-peculiar countermeasures. Slug firings will be conducted to demonstrate the capability to launch from the specified enclosures. Logistics Support Analysis (LSA) will be conducted to influence system design, evaluate system design and support alternatives, and document the supportability requirements of the selected design.

5. **Evaluation of Proposal:**

a. The underlying thrust of this solicitation, and the basis for weighting each of the evaluation factors in Section M, is to select candidate(s) for the Development/Proveout Phase that give **the trained infantry soldier, in the combat environment,** the highest likelihood of defeating the postulated threat, at least risk, and with the best potential for subsequent Preplanned Product Improvement (P^3I) in penetration capability and accuracy, within the specified size and weight.

b. The cost evaluation will consider projected total system life-cycle cost based upon Design-to-Unit Production Cost (DTUPC) and O&S costs **including manpower and personnel (recruiting and retention) costs, both institutional and unit training burdens** (time and cost), and intermediate and depot maintenance. Selection of the system to enter the Production and Deployment Phase will be based upon system effectiveness, system survivability, and life-cycle cost. Offerors should be aware that proposal evaluation will be based upon examination of such factors as:

(1) Probability of kill in manned firings.

(2) Manpower and Personnel Integration (MANPRINT) factors, such as ease and simplicity of operation, soldier performance contribution to probability of kill; total system manpower requirements, personnel aptitude requirements; and the institutional (skill attainment) and unit (skill sustainment) training burdens for operation, maintenance, and support.

(3) Weapon durability, ease of maintenance, and hardening to countermeasures.

(4) Survivability. The desired outcome of this phase is to select the one best candidate that achieves the above and best shows the feasibility and plausibility of achieving the requisite performance in the succeeding Production Phase.

c. The evaluation will be based on four areas: Technical and Operational Suitability, **MANPRINT,** Cost, and Management. Technical and Operational Suitability will be weighted heaviest. **MANPRINT** and cost are separate, equal major evaluation factors and are important for their design implications. Management will be the least heavily weighted factor.

(1) The strongest emphasis will be given to the Technical and Operational Suitability area, including Integrated Logistic Support (ILS), with the factors (described in Section M of the RFP) chosen to discriminate clearly among concepts.

(2) MANPRINT will be important because of the high likelihood of a significant soldier contribution to the error budget of the system and because of the desire to obtain the best trade-off among aptitude, training burden, and field performance of the system.

(3) Life-Cycle Cost will be a major evaluation factor; hence, offerors should propose inherently cost-effective designs.

(4) Management will be the least heavily weighted factor, and will assess the offerors' organizational structure, system engineering, configuration, and design-to-cost management, as well as past performance in on-time delivery of quality products, and transitioning from Development/Proveout to Production.

6. **Summary of ZAPPER Requirements:**

a. The ZAPPER hardware, which includes one round, the command and launch unit (CLU), a carry bag if required, and any other components required to engage a target and perform surveillance for at least four consecutive hours shall:

(1) have a total hardware component weight of not more than 19 kg (required). A total weight of 14.5 kg or less is desired.

(2) have a carry length of no greater than 120 cm.

(3) be compatible (with adaption devices/techniques to be developed as part of the ZAPPER Systems) with storage racks on the Bradley Fighting Vehicle; (BFV), the High Mobility Multipurpose Wheel Vehicle (HMMWV), and the U.S. Marine Corps Light Armored Vehicle (LAV).

(4) have an employment time (from unassembled carrying mode) of ≤ 1.5 minutes and a rate of fire of four rounds per three minutes.

(5) have a design that minimizes soldier aptitude requirements and minimizes institutional and unit training time.

(6) have a capability to fire from enclosures (38.5 cu. meters with 2.5 sq. meters of openings) safely.

(7) have a CLU mean time between operational mission failure of not less than 130 hours.

(8) be designed for ease of maintenance using line replaceable units (LRU).

(9) have an add-on remote launch capability (desired) from a distance of at least 50 meters with additional weight not greater than 12 kg.

(10) be designed to minimize the potential health hazards to the user and maintainer from sources such as acoustical energy (impulse noise/blast overpressure), chemical substances (combustion products from weapon firing), and radiated energy (heat/visible flash).

b. All these requirements must be integrated in the total system performance envelope.

7. This executive summary is provided as an administrative convenience and is not intended in any way to alter the terms and conditions of the RFP.

John S. Kinder
Contracting Officer

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SECTION A

SOLICITATION/CONTRACT FORM

DAAHBO2-87-R-0001

INFORMATION TO OFFERORS OR QUOTERS
(Section A - Cover Sheet)

SOLICITATION NUMBER
☐ ADVERTISED (IFB) ☒ NEGOTIATED (RFP)
☐ NEGOTIATED (RFQ)

ISSUING OFFICE (Complete mailing address including Zip Code)

U.S. Army Ballistics Command
ATTN: USABC-PC-AD/Stonewall
Flintstone Arsenal, GA 68477-5411

ITEM(S) TO BE PURCHASED (Brief description)

ZAPPER Anti-Armor Weapon System

THIS PROCUREMENT IS:

☒ UNRESTRICTED * ☐ SET-ASIDE (This is a _____% set-aside for ☐ Small Business, ☐ Labor Surplus Area Concerns or ☐ Combined Small Business/Labor Surplus Area Concerns.) (See Section C of the Table of Contents in this solicitation for details of the set-aside.)

*U.S. PRIME CONTRACTORS ONLY (SECTION B-8)

NOTE THE AFFIRMATIVE ACTION REQUIREMENT OF THE EQUAL OPPORTUNITY CLAUSE WHICH MAY APPLY TO THE CONTRACT RESULTING FROM THIS SOLICITATION.

You are cautioned to note the "Certification of Non-Segregated Facilities" in the solicitation. Failure to agree to the certification will render your reply nonresponsive to the terms of solicitations involving awards of contracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause.

"Fill-ins" are provided on the face and reverse of Standard Forms 18 and 33, or other solicitation documents and Sections of Table of Contents in this solicitation and should be examined for applicability.

See the paragraph of this solicitation entitled "Late Bids, Modifications of Bids or Withdrawal of Bids" or "Late Proposals, Modifications of Proposals and Withdrawals of Proposals".

The envelope used in submitting your reply must be plainly marked with the Solicitation Number, as shown above and the date and local time set forth for bid opening or receipt of proposals in the solicitation document.

If NO RESPONSE is to be submitted, detach this sheet from the solicitation, complete the information requested on reverse, fold, affix postage, and mail. NO ENVELOPE IS NECESSARY.

Replies must set forth full, accurate, and complete information as required by this solicitation *(including attachments)*. The penalty for making false statements is prescribed in 18 U.S.C. 1001.

ADDITIONAL INFORMATION

Funds are not presently available for this acquisition. No contract will be made until incrementally appropriated funds are available from which payment for contract purposes can be made.

FOR INFORMATION ON THIS PROCUREMENT WRITE OR CALL

NAME AND ADDRESS	TELEPHONE (Area Code, No. & Ext.)	TO COLLECT CALLS
Commander U.S. Army Ballistics Command, ATTN: USABC-PC-AD/Stonewall Flintstone Arsenal, GA 68477-5411	(804) 943-1066	

DD FORM 1707 1 FEB 78

REPLACES DD FORMS 1706 AND 1707 WHICH ARE OBSOLETE

NO RESPONSE FOR REASONS CHECKED			
	CANNOT COMPLY WITH SPECIFICATIONS		CANNOT MEET DELIVERY REQUIREMENT
	UNABLE TO IDENTIFY THE ITEM(S)		DO NOT REGULARLY MANUFACTURE OR SELL THE TYPE OF ITEMS INVOLVED
	OTHER (Specify)		
	WE DO		WE DO NOT, DESIRE TO BE RETAINED ON THE MAILING LIST FOR FUTURE PROCUREMENT OF THE TYPE OF ITEMS INVOLVED

NAME AND ADDRESS OF FIRM (Include Zip Code)	SIGNATURE
	TYPE OR PRINT NAME AND TITLE OF SIGNER

FROM

AFFIX STAMP HERE

TO:

SOLICITATION NO. DAAHB02-87-R-0001

DATE AND LOCAL TIME 16 Jul 1987-1600 Hrs

SOLICITATION, OFFER AND AWARD	1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 350)	RATING DE-86	PAGE OF 1 PAGES

2. CONTRACT NO.	3. SOLICITATION NO.	4. TYPE OF SOLICITATION	5. DATE ISSUED	6. REQUISITION/PURCHASE NO.
	DAAH802-87-R-0001	☐ SEALED BID (IFB) ☐ NEGOTIATED (RFP)	22 DEC 86	

7. ISSUED BY	CODE	8. ADDRESS OFFER TO (If other than Item 7)
U.S. Army Ballistics Command ATTN: USABC-PC-AD/H. Stonewall Flintstone Arsenal, GA 68477-5411		

NOTE: In sealed bid solicitations "offer" and "offeror" mean "bid" and "bidder".

SOLICITATION

9. Sealed offers in original and 5 copies for furnishing the supplies or services in the Schedule will be received at the place specified in Item 8, or if handcarried, in the depository located in Bldg 1348 Rm 2026 until 1600 (Hour) local time 16 Jul 1987 (Date)

CAUTION – LATE Submissions, Modifications, and Withdrawals: See Section L, Provision No. 52.214-7 or 52.215-10. All offers are subject to all terms and conditions contained in this solicitation.

10. FOR INFORMATION CALL:	A. NAME	B. TELEPHONE NO. (Include area code) (NO COLLECT CALLS)
	Harvey J. Stonewall	(804) 943-1066

11. TABLE OF CONTENTS

(X)	SEC	DESCRIPTION	PAGE(S)	(X)	SEC	DESCRIPTION	PAGE(S)
		PART I – THE SCHEDULE				PART II – CONTRACT CLAUSES	
X	A	SOLICITATION/CONTRACT FORM		X	I	CONTRACT CLAUSES	
X	B	SUPPLIES OR SERVICES AND PRICES/COSTS				PART III – LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACH.	
X	C	DESCRIPTION/SPECS./WORK STATEMENT		X	J	LIST OF ATTACHMENTS	
X	D	PACKAGING AND MARKING				PART IV – REPRESENTATIONS AND INSTRUCTIONS	
X	E	INSPECTION AND ACCEPTANCE					
X	F	DELIVERIES OR PERFORMANCE		X	K	REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS	
X	G	CONTRACT ADMINISTRATION DATA		X	L	INSTRS., CONDS., AND NOTICES TO OFFERORS	
X	H	SPECIAL CONTRACT REQUIREMENTS		X	M	EVALUATION FACTORS FOR AWARD	

OFFER (Must be fully completed by offeror)

NOTE: Item 12 does not apply if the solicitation includes the provisions at 52.214-16, Minimum Bid Acceptance Period.

12. In compliance with the above, the undersigned agrees, if this offer is accepted within _____ calendar days (60 calendar days unless a different period is inserted by the offeror) from the date for receipt of offers specified above, to furnish any or all items upon which prices are offered at the price set opposite each item, delivered at the designated point(s), within the time specified in the schedule.

13. DISCOUNT FOR PROMPT PAYMENT (See Section I, Clause No. 52.232-8)	10 CALENDAR DAYS %	20 CALENDAR DAYS %	30 CALENDAR DAYS %	CALENDAR DAYS %

14. ACKNOWLEDGMENT OF AMENDMENTS (The offeror acknowledges receipt of amendments to the SOLICITATION for offerors and related documents numbered and dated)	AMENDMENT NO.	DATE	AMENDMENT NO.	DATE

15A. NAME AND ADDRESS OF OFFEROR	CODE	FACILITY	16. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER (Type or print)

15B. TELEPHONE NO. (Include area code)	15C. CHECK IF REMITTANCE ADDRESS IS DIFFERENT FROM ABOVE – ENTER SUCH ADDRESS IN SCHEDULE	17. SIGNATURE	18. OFFER DATE
	☐		

AWARD (To be completed by Government)

19. ACCEPTED AS TO ITEMS NUMBERED	20. AMOUNT	21. ACCOUNTING AND APPROPRIATION

22. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION:

☐ 10 U.S.C. 2304(c)( ) ☐ 41 U.S.C. 253(c)( )

23. SUBMIT INVOICES TO ADDRESS SHOWN IN (4 copies unless otherwise specified) ITEM

24. ADMINISTERED BY (If other than Item 7)	CODE	25. PAYMENT WILL BE MADE BY	CODE

26. NAME OF CONTRACTING OFFICER (Type or print)	27. UNITED STATES OF AMERICA (Signature of Contracting Officer)	28. AWARD DATE

IMPORTANT – Award will be made on this Form, or on Standard Form 26, or by other authorized official written notice.

STANDARD FORM 33 (REV. 4-85)
Prescribed by GSA
FAR (48 CFR) 53.214(c)

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ATTACHMENT 01

STATEMENT OF WORK
(SOW)

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STATEMENT OF WORK

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Statement of Work
(SOW)

1.0 **SCOPE.** The contractor shall develop a weapon capable of satisfying the performance criteria stated in the ZAP4000 System Specification, with particular emphasis on achieving (a) the probability of hit by a fully-trained gunner (with no greater aptitude than forecasted) in both clear and obscured conditions, (b) tracking of targets under battlefield conditions, and (c) gunner survivability features. The contractor shall furnish all services, materials, facilities (except approved Government Furnished Equipment (GFE) facilities) and equipment and provide all technical, planning, management, and manufacturing effort to complete the tasks described in the following paragraphs of this SOW. The contractor shall deliver reports, briefings, and design documents as specified and scheduled on the DD Forms 1423.

2.0 **REFERENCE DOCUMENTS.**

2.1 **Military Specifications.** (Omitted from example)

2.2 **Military Standards.** (Omitted from example)

2.3 **Other Publications.** (Omitted from example)

3.0 **REQUIREMENTS.**

3.1 **Fabrication.** The contractor shall define, fabricate, and maintain all hardware required for the Development/Proveout phase. Deliverables shall be as specified in the contract.

3.1.1 **Round.**

3.1.1.1 **Air Vehicle.** The contractor shall perform the necessary design tasks and trade-off analyses to establish the air vehicle characteristics. The contractor shall design, fabricate, and test components, subsystems, and complete air vehicles to demonstrate design and performance capabilities. The contractor shall be responsible for integration of all air vehicle sections.

3.1.1.2 **Airframe Integration and Assembly.** The contractor shall ensure the structural integrity, mating of components and/or sections, interfacing with launcher assembly, and the meeting of the physical and functional require-

ments for the air vehicle. As a minimum, specific hardware areas/items to receive emphasis during analyses and tests include warhead section/propulsion interface, stabilizing fins and attachments, electrical networks, electrical power supply, and air vehicle to launcher interfaces (e.g., umbilical connectors, detents).

3.1.1.3 **Guidance and Control.** The contractor shall develop the guidance and control subsystems and components of the air vehicle. The guidance and control design shall provide the accuracy needed to meet the requirements of ZAP4000.

3.1.1.4 **Warhead Section.** The contractor shall perform design tasks to establish a warhead section demonstrating the capability to defeat the target and meet the requirements of ZAP4000.

3.1.1.5 **Propulsion Section.** The contractor shall perform design tasks necessary to establish a propulsion unit capable of demonstrating the capability to meet the requirements of ZAP4000.

3.1.1.6 **Telemetry Section.** The contractor shall define the requirements for onboard test instrumentation necessary to support the flight test program outlined in paragraph 3.2.1.2 of this SOW. In addition, the contractor shall perform design tasks and provide a telemetry section to transmit engineering data to a ground receiving station for recording. The contractor shall also provide the interface hardware for assembly into the air vehicle. A method shall be provided for determining target hit coordinates.

3.1.1.7 **Mock-up Rounds.** Mock-up rounds (inert) shall be designed with the same physical, dimensional, and electrical connectors as the tactical launcher. These rounds will be used for operational testing and field exercises, and shall be required to handle, and look identical (except for markings) to the tactical launcher including the weight of the air vehicle. The configuration shall be designed to achieve the objective of the Operational Assessment of paragraph 3.2.2.1.

3.1.2 **Launcher.** The contractor shall develop a launcher to satisfy the requirements of ZAP4000. Emphasis shall be placed on designing devices to restrain the air vehicle in the launch tube during storage and handling which have minimal effect on the air vehicle during separation at launch. All air vehicle/launch tube interfaces shall be analyzed for interference during

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launch and the effect on launch tip off. CLU/round interfaces shall be defined with emphasis on mechanisms which effectively mate and align the CLU with the round. Methods of electrical hook-up and firing disconnect shall be analyzed for performance and safety.

3.1.3 **Command and Launch Unit (CLU).**

3.1.3.1 **CLU.** The contractor shall develop a Command and Launch Unit meeting the requirements of ZAP4000. Maximum use shall be made of standard, nomenclatured battery power sources and battery chargers (if applicable). The contractor shall design a night sight device which will demonstrate the capability to meet the performance criteria in paragraph 3.2.1.3. If the Thermal Weapon Sight (TWS) is utilized and requires integration into the CLU, the following TWS assemblies shall be used without design change: Signal/Timing, Controller, Dewar, Scanner, Infrared Imager, and LED/Visual Collimator or Cathode Ray Tube Display. Assemblies that may be changed are the telescope, main housing, control panel, battery, visual relay/eyepiece, and the wiring harness.

3.1.3.2 **Integration and Assembly.** The contractor shall ensure the integration and assembly of the fire control components and power supply with the day/night sights as determined necessary for operation.

3.1.3.3 **Mock-up CLU.** The contractor shall design CLUs (inert) with the same physical and dimensional characteristics of the tactical CLU for operational and field exercises. The mock-up CLU shall mate with the mock-up round. The configuration shall be designed to achieve the objectives of the Operational Assessment Test of paragraph 3.2.2.1.

3.2 **Test and Evaluation.**

3.2.1 **Contractor Test Program.** The contractor shall plan and conduct a system test program to include soldier critical performance and supporting training as well as necessary piecepart, component, subassembly, assembly, and end item testing to demonstrate that hardware and software meet the requirements of ZAP4000. The Test Program shall assure that requirements are met in the following areas:

Defeat of Threat Targets and Achievements of Required $P_{k/s}$

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System Accuracy with Man-in-Loop Firings Against Stationary and Moving Targets

Target Acquisition and Tracking in countermeasure (CM) and Obscured Environments

Track Link Hardness to Practical CM

Hardware Portability

Weight and Length

Capability for Firing the Weapon Within Enclosures

Safety, Health, and Human Factors.

The contractor Test Program shall include the tests specified below:

3.2.1.1 (Paragraph not used)

3.2.1.2 **System Flight Test Program.** The objectives of the System Flight Test Program are to prove system capability with special emphasis on accuracy, performance in degraded visibility (including night), and a minimum and maximum range. Tests will be planned and conducted by the contractor with government support at facilities at the U.S. Army Missile Range, White Sands, New Mexico. Minimum acceptable results of these tests shall be successful engagement (target hit plus adequate $P_{k/s}$) of five (5) of the first nine (9) target profiles listed in Paragraph 3.2.1.2.1. The five (5) successes must include profiles 1 through 3. The government supported contractor conducted flight test program shall be performed in accordance with the test matrix shown below with a minimum test quantity of 24 missiles. **All flights shall have a man-in-the-loop and shall be conducted with contractor gunners and with at least two military gunners representative of the TAD. The gunner operating the CLU shall be remote from the launcher and protected from any launch and flight hazards (to include failures).**

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3.2.1.2.1 **Flight Test Matrix.** The Flight Test Matrix is as follows:

Flight Profile Number	Range to Target (M)	Stationary or Moving Target	Smoke	Day or Night	Target in Hull Defilade
1	1,500	Stationary	No	Day	Yes
2	1,200	30 KM/H	No	Day	No
3	400	30 KM/H	Yes	Night	No
4	1,500	Stationary	No	Night	No
5	1,000	Stationary	No	Night	Yes
6(Direct Fire Mode)	400	30 KM/H	Yes	Day	No
7	1,000	30 KM/H	No	Night	No
8	1,800	Stationary	No	Day	No
9	1,000	15 KM/H	Yes	Day	Yes

3.2.1.2.2 **Flight Profiles.** Twelve of the missiles will be fired by the military gunners against flight profiles 1 through 9 with at least one round at each profile. Any rounds remaining after successful completion of the profiles may be used to demonstrate any other capabilities of the system. White phosphorous smoke and crossing tank targets will be used in the above profiles.

3.2.1.2.3 **Tank Targets.** The tank targets utilized for the system flight tests will be provided by the government.

3.2.1.3 **CLU Tests.** Field tests of the CLU in conjunction with the missile seeker/sensor subsystem shall be conducted to demonstrate performance in the dirty battlefield environment. The tests shall include target acquisition, surveillance, and tracking accuracy. Tests shall be conducted in selected environments with electronic and optical jammers, countermeasure smoke, flares, burning vehicles, rain, fog, and dust. Performance boundaries/capabilities shall be assessed by testing ranges beyond the specified system maximum range. Military gunners representative of the TAD shall be provided by the government and participate as test subjects throughout this test. Data resulting from the field tests shall be used to verify the contractor's simulation, training program, and to provide acquisition and tracking accuracy data.

3.2.2 **Test and Evaluation Support.**

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3.2.2.1 **Operational Assessment.** The contractor shall support an operational assessment planned and conducted at the Human Engineering Laboratory at Aberdeen Proving Ground, MD, and the U.S. Army Infantry School at Ft. Benning, GA. The objective of this assessment is **to determine operational compatibility of the system hardware with the soldier's fighting load and modes of battlefield mobility; the overall system performance as a product of soldier aptitude, training, and organization; the effectiveness of the SMI**; and the viability of the system hardware characteristics such as **portability**, physical dimensions, and durability. **The government will provide, as test subjects, soldiers with known aptitudes and physical profiles who meet the TAD of potential operators, maintainers, and supporters of the equipment.** The contractor shall maintain the ten (10) sets of system hardware (which are complete except for inert warheads) delivered to support conduct of these tests.

3.3 **Configuration Management Program.**

3.3.1 **Program Requirement.** The contractor shall develop, implement, and manage a Configuration Management Program suitable for meeting the requirements of this SOW.

3.3.2 **Drawings.** (Omitted from example)

3.3.3 **Software.** (Omitted from example)

3.4 **Program Management.**

3.4.1 **Contractor Work Breakdown Structure (WBS).** For financial reporting purposes, the contractor shall develop a contract WBS, crossreferenced to the ZAP4000 system specification. The contractor WBS must provide for identifying and reporting each cost WBS affected to include software and firmware.

3.4.2 **Financial Management.** The contractor shall plan, budget, and implement a financial management program to control the resources allocated to meet the requirements of the SOW IAW the WBS.

3.4.3 **Monthly Progress Reports.** The contractor shall submit monthly progress reports including a final progress report at the end of the program.

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3.4.4 **Program Reviews.**

3.4.4.1 **Program Arrangements.** The contractor shall plan, coordinate, participate in, and support program reviews at his plant and at government installations to be identified during which the contractor's progress will be examined. The contractor shall prepare agenda and minutes of all such reviews.

3.4.4.2 **Program Review Meetings.** The first review meeting shall be conducted within three months after contract award. Subsequent reviews shall be conducted quarterly or as determined necessary by the government, based upon government initiative or requested by the contractor.

3.4.4.3 **Internally Generated Data.** The contractor shall prepare a list of internally generated data used by the contractor to develop, test, and manage the program.

3.5 **System Engineering Management.** The contractor shall design and develop the hardware using the "Metric System of Measurement" IAW ASTM-E380 and DOD-STD-1476. Engineering data, and technical reports, including computer programs, shall be generated in metric units.

3.5.1 **General.** (Omitted from example)

3.5.2 **Analyses/Studies.**

3.5.2.1 **Scope.** The contractor shall perform design analyses and trade-offs to ensure that the ZAPPER System attains or exceeds the performance requirements as specified in ZAP4000. These analyses shall include trade-offs considering cost and performance (to include Probability of Kill given an engagement) and shall reflect the operational concept to include the command, control, communications, military organizational configuration and the maintenance environment. Trade-offs between the elements of Probability of Kill given an engagement ($P_{rec} \times P_{rel\ rd} \times P_s \times P_{K/s}$) shall be considered if the overall requirement for $P_{k/e}$ can still be achieved. Alternative design shall be examined to identify tradeoffs among desired characteristics to increase the system's effectiveness in the following categories: lethality, portability, range, dirty battlefield/CM survivability, RAM, and gunner aptitude and training. The contractor shall assess the degradation in P_h occurring between the required and desired minimum

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ranges, and if appropriate, in the direct fire mode. Substantial improvement in lethality on a dirty battlefield and improvement of gunner survivability are primary priorities if accomplished with only small increases in system weight (not to exceed maximum allowable system weight). Although the proposed system must weigh no more than 19 kg, the offeror shall provide trade-offs of weight versus elements of the $P_{k/eng}$ equation and survivability in order to indicate the flexibility of his design. Curves or tables illustrating advantages of growing beyond the offeror's system weight (even though the maximum allowable weight is exceeded) will indicate possible growth advantages for specific missions (e.g., defense, vehicle mounted).

3.5.2.2 **System Flight Performance and Accuracy.**

3.5.2.2.1 **Performance Simulation.** The contractor shall prepare, validate, maintain, and deliver an all-digital, six Degree-of Freedom (DOF), performance simulation of the proposed system concept to include gunner effects (such as aptitude, training, organizational design, and human error). The six DOF performance simulation and computer programs shall be used and identified in the conduct of the analyses and studies.

3.5.2.2.2 **System Accuracy.** The contractor shall prepare a complete error budget breakdown identifying major factors (including soldier performance) contributing to system inaccuracy and the one sigma magnitudes of these quantities. Total errors as well as circular error probability shall be formulated and presented. Error budgets shall be presented for minimum and maximum range trajectories and for intermediate ranges in increments not to exceed 500 meters.

3.5.2.2.3 **System Sensitivity.** The contractor shall conduct studies to establish the sensitivity of system accuracy to independent variation in magnitude of each error source identified above.

3.5.2.2.4 **Control System Performance.** The contractor shall perform the overall systems analysis necessary to accurately define the total control subsystem performance requirements. This analysis shall justify the amount of control authority and the control system performance required in both the soft launch/coast mode and during the boost, sustain, and terminal phases of flight. Trade-off studies shall be performed by the contractor to identify the most cost-effective control system design approach which is consistent with the established control performance requirements.

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3.5.2.3 **Fuzing Effectiveness.** The contractor shall perform analyses of fuzing approaches to include, as a minimum, target and background signature(s) used for sensing, use of single or multiple target signatures, signal processing to discriminate real and false targets, CM/CCM techniques, safety considerations per MIL-STD-1316, graze sensitivity, and system analysis to achieve fuze optimization to maximize warhead effectiveness.

3.5.2.4 **Warhead Data.** The contractor shall collect and document data on characteristics of the lethal mechanism penetrator prior to target impact and after perforation of the target. The characteristics of behind armor debris or other behind armor damage mechanisms shall be measured and documented.

3.5.2.5 **System Battlefield Performance.** The contractor shall address the projected threat and battlefield conditions and perform studies and trade-off analyses to determine the manned system's ability to:

a. engage and hit a stationary target at one-half the maximum range of the system in daylight within 30 seconds after detection in a seven kilometer visibility, non-nuclear, benign countermeasures environment;

b. acquire and lock-on a target through electronic counter-measures, aerosol, smoke, dust, fog, rain, and other degraded atmospheric conditions, target background, and clutter;

c. engage and maintain a specified rate of fire against stationary, high crossing rate, evasive, and maneuvering targets; and

d. reduce gunner's exposure and reaction times, and the time of flight for the projectile.

3.6 **Reliability, Availability and Maintainability (RAM) Program.** (Omitted from example)

3.7 **Integrated Logistics Support (ILS) Program.** (Note: See AMC PAM 700-21, ILS Contracting Guide, for more complete example.)

3.7.1 **Logistics Support Analysis (LSA).** The contractor shall conduct LSA for this and subsequent phases of the program. Trade studies or alternate support concepts, including determining what would be required to completely eliminate field maintenance, will be performed. The predeces-

sor system support structure shall be used as the baseline. These analyses shall be coordinated with, and shall not duplicate, analyses conducted under the MANPRINT Program (Para. 3.8). The contractor shall perform the following specific LSA IAW MIL-STD-1388-1A.

Task 203, Subtask 203.2.5
Task 205 Subtasks 205.2.1, 205.2.2
Task 303 Subtasks 303.2.3, 303.2.5, 303.2.6, 303.2.9
Task 401, Subtasks 401.2.1, 401.2.4
Task 501, Subtask 501.2.3

3.7.2 **Publications.** The contractor shall prepare system operating instructions for the technical demonstration and operational assessment phases of the program for use by government personnel.

3.8 **Manpower and Personnel Integration (MANPRINT).**

3.8.1 **MANPRINT Program.** The contractor shall conduct a program integrating Manpower (Force Structuring), Personnel (Aptitude), Training, Human Factors Engineering, System Safety, and Health Hazards management so as to influence system design decisions throughout development, production, and deployment of the ZAPPER. The goals of MANPRINT in the ZAPPER program are to improve overall weapon system cost-effectiveness in the field by determining, during preliminary system design, that equipment and organizational design which yields the highest P_h with the minimum burdens on soldier aptitude and institutional and organizational training. A Manufacturer's MANPRINT Management Plan (MMMP) shall be prepared and maintained in a current status throughout ZAPPER development. The contractor's organization for managing the execution of the MANPRINT program shall be at a management level comparable to the levels responsible for cost and system performance. MANPRINT shall be an agenda item at all program and technical reviews. Through analyses, the MANPRINT program shall link aptitudes of operations, maintenance, and support personnel with the contractor-developed Integrated Training System (ITS) (Para. 3.8.5). These analyses shall be coordinated with the analyses conducted under LSA tasks (Para. 3.7.1).

3.8.2 **MANPRINT Implementation.** The contractor shall form a MANPRINT Working Group with soldier participation as appropriate to address soldier performance of critical operations, maintenance, and support tasks required

by ZAPPER hardware/software. All soldier performance tasks influencing system performance shall be documented in accordance with para. 3.1.1a of MIL-H-46855. The contractor shall establish and validate soldier performance through analyses, simulations, demonstrations, and tests.

3.8.3 **Manpower.** The contractor shall conduct analyses to identify the leanest organizational structures for operations, maintenance, and support of the ZAPPER which will reliably meet the effectiveness and availability requirements stated in ZAP4000. These analyses shall be coordinated with LSA analyses, shall clearly identify the baseline organizational structures used (i.e., predecessor system or similar system), and shall include estimates of training time and costs for each organizational alternative considered in the analyses.

3.8.4 **Personnel.** In coordination with LSA tasks, the contractor shall conduct analyses to minimize personnel aptitude requirements for operation, maintenance, and support of the ZAPPER. One analysis shall specifically address the trade-off between soldier aptitude and training time and cost (see paras. 4.1.2.1.2 and 4.1.2.1.3 of ZAP4000). The Hardware versus Manpower (HARDMAN) comparative analysis technique shall be used to establish a baseline of manpower and personnel requirements for the system.

3.8.5 **Training.** The contractor shall develop an ITS package to support institutional and non-institutional training for operator, maintainer, and support personnel. (See paragraph 3.6.3 of ZAP4000.) The ITS shall consider Embedded Training (ET), as the first training alternative. The non-institutional training shall include New Equipment Training. Development of the ITS shall utilize the same task analysis data base as is used for the ILS and Quality Assurance Programs. Final acceptance of the ITS shall be contingent upon successful demonstration of training effectiveness at OT.

3.8.5.1 **Training Devices.** The contractor shall propose and, upon approval by the procuring activity, design training devices that are based on and exhibit traceable, hierarchical relationships to the operations, maintenance, and support tasks (individual and collective) for which each individual device will train. Such training devices will duplicate the hardware components of the ZAPPER System in configuration, function, and performance to the degree of fidelity necessary to train operator, maintainer, and support tasks and skills. A learning analysis that considers current Army training methodology

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shall be used to determine the optimum mix of training devices required, dependent upon learning difficulty and task criticality. The contractor shall validate the training effectiveness of the devices designed by the contractor.

3.8.5.2 **Test Personnel Training.** Using the ITS, the contractor shall provide training to selected government test personnel in system description, theory of operation, and demonstration hardware. Two courses, not to exceed one week duration each, shall be conducted (a minimum of 30 days prior to the start of non-firing tracking tests and the operational assessment). Class size will be approximately 25. Equipment used in conducting training shall be furnished by the contractor. Maintenance of the training equipment shall be the responsibility of the contractor.

3.8.6 **Human Factors Engineering (HFE).**

3.8.6.1 **Planning and Execution.** An adequately staffed HFE effort shall be dedicated to and be an integral part of the ZAPPER analysis, design, and test process. An HFE program effected by personnel limited to consulting or ex post facto review roles will not suffice. Accordingly, an HFE Program shall be planned and implemented in accordance with MIL-H-46855, as tailored for the ZAPPER full-scale development objectives, characteristics and constraints, as follows:

Paragraph 3.1.1a - Delete first three sentences. Change seventh line to: "Each task which must be performed to accomplish allocated functions shall be analyzed to determine the human . . ."

Paragraph 3.2.1.1 - Delete.

Paragraph 3.2.1.1.1 - Delete.

Paragraph 3.2.1.1.2 - Delete.

Paragraph 3.2.1.1.3 - Delete.

Paragraph 3.2.2 - In 2nd line, delete all text following "equipment." Delete 3rd line. In 4th line, delete "other appropriate."

Paragraph 3.2.2.3c - Delete.

Paragraph 3.2.2.5 - In 12th and 13th lines, change "shall be reflected" to "are available for inclusion."

Paragraph 3.4 - In 2nd line, change "shall" to "should."

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3.8.6.2 **Scope.** The HFE analytic, design, and test activities shall include compensation for the effects of personal equipment; clothing; protective gear; extremes of natural environment including atmospheric, degraded visibility, thermal, and terrain conditions as defined by system requirements; workload contingencies; and combat and training scenarios for each deployment mode and intended duty cycle (normal, sustained and emergency.) The impact of equipment, software, and procedures on personnel availability, training times, skill levels, proficiency, and operation and maintenance under stress shall be assessed to minimize demands on personnel resources, consistent with ZAPPER system performance requirements.

3.8.6.3 **HFE Program Emphasis Areas.** Within the context of the above considerations, the HFE program shall include, as a minimum, the following emphasis areas:

3.8.6.3.1 **Studies and Analyses.** HFE studies and analyses of the ZAPPER system shall be performed as applicable to the objectives of the contract in the areas outlined by MIL-H-46855 (as tailored) in general and the following system functions and issues in particular:

3.8.6.3.1.1 **Portability/Soldier-Transportability.** Suitability of equipment loads, weight, and configuration to meet portability/soldier transportability requirements.

3.8.6.3.1.2 **Launcher configuration and controls.** Suitability of launcher configuration to facilitate the gunner's performing shoulder-to-weapon ready-to-fire in a safe, error-free manner, consistent with specified requirements; location, configuration, and actuation characteristics of launcher controls for tube extension, safe and arm, ranging, uncaging, aiming, and firing.

3.8.6.3.1.3 **Crew Task Sequence.** Capability of integrated hardware/software /personnel/procedures to undertake emplacement, orientation, alignment initialization, checkout, firing, displacement, march order, and resupply, consistent with system performance requirements.

3.8.6.3.1.4 **Nuclear, Biological, Chemical (NBC) Environment.** Capability for the system and crew to withstand an NBC contaminated environment and decontamination without losing the ability to accomplish the assigned mission.

3.8.6.3.1.5 **Maintainer Interface.** Suitability of maintainer/hardware/ software/pro-

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cedures to facilitate the meeting of system performance requirements including accomplishing maintenance involving fault isolation, manipulation, access, removal, replacement, and repair; manual operations involving pulling, pushing, lifting, or carrying; and compatibility of tools with tasks, handwear, and environment.

3.8.6.3.1.6 **Critical Tasks.** Analysis of critical tasks shall include consideration of command, control, and communications; target acquisition including search, detection, recognition, and identification; firing and reload; target tracking; aim point designation; and ranging. Task analysis shall use the same task data base as is used for the ILS and Quality Assurance Programs.

3.8.6.3.2 **Design and Application.** Human engineering applications to design shall be governed by that human performance necessary to meet or exceed system requirements as stated by the system specification and conformance to the provisions of MIL-STD-1472 cited in ZAP4000. Analysis findings shall be applied to the system design.

3.8.6.3.3 **Test and Evaluation.** HFE requirements shall be integrated into ZAPPER test and evaluation to demonstrate the capability of the crew-system interface to attain required system performance characteristics in general, and to specifically include: reaction times (emplacement, fire mission, resupply, and march order, weapon from carry configurations to ready-to-fire, engagement sequence, checkout and initialization, fault isolation, replacement, and repair); accuracies (fire coordination entry, launch sequence, tracking, target designation, data insertion, aiming, firing, and tracking); and adequacy of operating and maintenance procedures. Testing shall thoroughly assess human performance and human engineering design under all gunner postures and conditions of terrain, slope, climate, lighting, and stress. HFE tests may be integrated into other ZAPPER tests. Dedicated HFE tests shall be performed when time and accuracy requirements are primary determinants of mission success or where demonstrations of the manned system are essentially human engineering-dependent.

(Note: Paragraph 3.8.6 above is adapted from reference #86.)

3.8.7 **System Safety and Health Hazards.**

3.8.7.1 **System Safety.** The contractor shall conduct a system safety program that

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comprehensively evaluates the safety risks being assumed and shall identify all residual design and procedural hazards present (IAW Section 4 of MIL-STD-882), and all safety features of the system and components. The program shall also specify the procedural controls and precautions required to protect personnel, equipment, and property during testing. To ensure that an adequate level of safety has been achieved, verification of design compliance with applicable safety standards, codes, and the safety requirements critical to man-in-the-loop testing shall be provided. In addition, specific test data and analyses on the design margins, and other characteristics of each critical component of the system shall be furnished in order to assess the safety of the system for man-in-the-loop firings. As a minimum, the following hazard analyses shall be performed:

a. Rocket motor firing circuit analysis (including abnormal events such as
late flight motor ignition).

b. Warhead safe & arm/fuzing analysis.

c. Launch environments/effects analysis.

3.8.7.1.1 **System Safety Program Tasks.** The following task of MIL-STD-882 specifically apply:

Task 100 System Safety Program
Task 101 System Safety Program Plan
Task 104 Special Study Groups/System Safety Working Group SSG/SSWG Support
Task 105 Hazard Tracking and Risk Resolution
Task 106 Test and Evaluation Safety
Task 202 Preliminary Hazard Analysis
Task 203 Subsystem Hazard Analysis
Task 204 System Hazard Analysis
Task 205 Operating and Support Hazard Analysis
Task 206 Occupational Health Hazard Assessment
Task 207 Safety Verification
Task 209 Safety Assessment
Task 210 Safety Compliance Assessment

3.8.7.1.2 **Surface Danger Area Data.** Prior to firing rounds on any government range, preliminary surface danger area designation and supporting data shall be prepared IAW DD Form 1423.

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3.8.7.1.3 **Explosive Hazard Classification.** The government will assign an interim hazard classification for explosive devices produced under this contract and delivered to the government. The contractor shall furnish any existing approved Department of Transportation classifications, analogy data, and/or existing test data for all energetic materials delivered under this contract. Lab sensitivity test data shall be submitted as a minimum.

3.8.7.2 **Health Hazard Assessment.**

3.8.7.2.1 **Acoustical Energy.** The contractor shall design the ZAPPER system to comply with the requirements of MIL-STD-1474. Provisions shall be made to collect data for impulse noise/blast overpressure in accordance with MIL-STD-1474. (See para. 3.8.7.3.1 below.)

3.8.7.2.2 **Lasers.** The contractor shall make provisions to prevent exposure of personnel to hazardous intensities of laser beams associated with the system. The contractor shall comply with guidelines for personnel protection outlined in AMC Reg 385-29.

3.8.7.2.3 **Radioactive Materials.** Any radioactive materials proposed for use in the system will require DA authorization or Nuclear Regulatory Commission licensing. In the event that radioactive materials are proposed by the contractor, then analyses, controls, test results, and other required information shall be prepared LAW DD Form 1423.

3.8.7.2.4 **Chemical Substances.** The contractor shall design the system to ensure that operations and maintenance personnel will not be exposed to concentrations of toxic substances in excess of the limits specified in Occupational Safety and Health Agency standards.

3.8.7.3 **Safety and Health Hazards Assessment Tests.** The contractor shall conduct an orderly program of components, subsystem and system tests required to accomplish the program to include man-in-the-loop firings. The test plan shall identify specific tests to be conducted.

3.8.7.3.1 **Gunner Environment Launch Hazards Tests.** These tests include firing from enclosures and from unenclosed positions. The contractor shall compare measured parameters with those considered acceptable and shall provide data and support to assist in approving the soldier-rating and verifying the adequacy of protective measures.

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a. Acoustical energy testing shall be accomplished in accordance with sections 5.4 and 5.5 of MIL-STD-1474.

b. Measurement of shock (recoil) during slug firings.

c. Measurement of particle size, weight, and distribution pattern of flight motor debris from preset failures.

d. Qualitative and quantitative measurements of the noxious or toxic combustion products.

e. Measurement of thermal and visible energy effects (heat and flash).

3.8.7.3.2 **Bullet Impact Tests.** These tests shall demonstrate that the warhead section and propulsion section of the air vehicle meet the requirements of ZAP4000.

(Note: A slug is a dummy projectile with a replaceable launch motor that duplicates the size, weight, and other appropriate physical characteristics of the prototype air vehicle.)

3.8.8 **MANPRINT Reviews.** Conduct of the following reviews does not obviate the requirements for inclusion of MANPRINT in other reviews such as program reviews, technical review, Preliminary Design Review (PDRs), and Critical Design Review (CDRs).

3.8.8.1 **Program Planning.** A MANPRINT program planning review at the contractors plant, scheduled by the contractor, shall be undertaken no later than 30 DAC. The purposes of this program planning meeting are to:

a. Insure mutual understanding of the proposed MMMP to be submitted in accordance with the DD Form 1423.

b. Insure consistency of MANPRINT program planning with the objectives of the contract and applicable provisions of ZAP4000.

c. Discuss any tailoring of MIL-STD-1472 which the contractor anticipates proposing in the HFE Program Plan.

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d. Review general approach, assumptions, guidelines, schedule, and level of effort.

e. Surface problems and/or needs for contractor access to technical information for requirements clarification.

3.8.8.2 **MANPRINT Progress Reviews.** Two MANPRINT reviews shall be scheduled and conducted by the contractor. The first review shall be conducted not later than 30 days prior to the PDR; the second review shall be conducted not later than 30 days prior to the CDR. Each MANPRINT review shall cover at least the following:

a. Program Accomplishments.

b. System Integration and Interactions (including coordination with the ILS, RAM, and Quality Assurance Programs to minimize duplication of effort).

c. Principal Human Performance Requirements.

d. Human Engineering Design.

e. MPT, Health Hazard and Safety Implications.

3.8.8.3 **Training Conference Review (TCR).** The contractor shall host a TCR IAW MIL-STD-1379 NLT 60 days after contract award. At the discretion of the government, additional TCRs may be convened with contractor and subcontractor personnel.

3.8.8.4 **HFEA Review.** An HFEA Review, scheduled by the contractor no later than 5 months prior to the Milestone III Preliminary Review, shall be provided at the contractor's facility. The HFEA Review shall cover the topics below.

3.8.8.4.1 **System Description.** The system shall be described to the degree required to orient participants regarding integration of the gunners, controllers, and maintainers.

3.8.8.4.2 **System Integration and Interactions.** Evidence shall be presented to insure that the system will work effectively with those other systems with

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which it interfaces and that the soldier performance requirements for such integrated operation are consistent with planned human resources.

3.8.8.4.3 **Principal Soldier Performance Requirements.** System operation and maintenance requirements (e.g., time and accuracy) which depend on soldier performance shall be summarized. Critical tasks upon which satisfactory performance and/or the system's effectiveness depends shall be identified. Review of such critical tasks shall therefore include: a) System performance requirements, b) critical tasks driving such performance, c) human performance requirements of these critical tasks, d) equipment/software involved with the critical tasks, and e) the range of operational and environmental conditions anticipated during performance of the critical tasks.

3.8.8.4.4 **System HFEA.** The following six topics shall be covered:

a. Identification of Soldier Performance Requirements for Operations and Maintenance.

b. Design of Hardware and Software (including rationale for allocation of functions to soldiers).

c. Personnel Selection Issues (created because of the perceived necessity to have aptitude-sensitive critical tasks).

d. Training Issues (including results of trade-off analyses between aptitude and training and resultant soldier performance). (See para. 3.8.5.)

e. Safety risks, if any. If none, so state and provide supporting rationale. (See para. 3.8.7.1)

f. Health Hazards, if any. If none, so state and provide supporting rationale.

(Note: Paragraph 3.8.8 above is adapted from reference #86.)

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SECTION J

LIST OF DOCUMENTS, EXHIBITS, AND OTHER ATTACHMENTS

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SECTION J - LIST OF ATTACHMENTS

The following documents, attachments, and exhibits comprise this solicitation:

	Document	Number of Pages
a.	DD Form 1707, "Information to Offerors or Quotes"	2
b.	Standard Form 33 (REV 4-85) "Solicitation, Offer, and Award" (Section A)	1
c.	Sections B and C	(Omitted from example)
d.	Attachment 01, Statement of Work	23
e.	Sections L thru M	13
f.	Attachment 02, DD Form 254, "Contracts Security Classification Specifications"	(Omitted from example)
g.	Exhibit A, DD Form 1423, "Contract Data Requirements List"	12
h.	One Time Data Item	2
i.	Exhibit B, "Document Summary List"	(Omitted from example)
j.	Attachment 03, ZAP4000, "System Specification"	19
k.	Attachment 04, ZAP4050, "Environmental Requirements"	(Omitted from example)
l.	Target Audience Description	(Omitted from example)

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SECTION L

INSTRUCTIONS AND CONDITIONS AND NOTICES TO OFFERORS

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SECTION L - INSTRUCTIONS AND CONDITIONS AND NOTICES TO OFFERORS

L.1 through L.14. (Omitted from example)

L.15 INSTRUCTIONS FOR PROPOSAL PREPARATION

L.15.1 **INSTRUCTIONS FOR PROPOSAL PREPARATION.** The offeror's response to this RFP shall be submitted in four volumes, organized as stated below. Total pages shall be limited to 600. It is required that the offeror submit with the proposal a physical mock-up of the weapon having the weight, center of gravity, and handling characteristics of the tactical system. **The mock-up will be used for initial evaluation of the soldier-machine interface of the proposed concept.** All volumes and sub-volumes shall include the following:

a. Title Page
b. Table of Contents
c. List of Tables and Figures
d. Brief Introduction and Summary

The proposal shall contain the offeror's proposed line of investigation; method of approach to the program; and phases into which the program may logically be divided, with schedules for completion of each phase. Offerors shall reference the proposal to the section of the RFP to which it responds. (This may be by cross-referencing, for example: Technical proposal paragraph 3.3.2 responds to system specification 3.3.2; or by providing a cross-reference matrix). The ZAP-400 System Specification and the SOW reflect the requirements of the program. The offeror should clearly indicate how the requirements of the program will be fulfilled.

L.15.1.1 **Volume 1, Executive Summary.** Recommended not to exceed 30 pages. Cover the management program, master schedules, system performance, system design, development planning, proposed testing, reliability and maintainability, ILS, MANPRINT, configuration management, employee skills to be made available, company and other facilities utilized, program or project organization relationship, and management techniques to be employed.

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L.15.1.2 **Volume 2, Technical and Operational Suitability.**

a. **Volume 2, Section 1, System/Operational Performance.** Recommended not to exceed 140 pages. Provide details of the proposed manned system performance, with supporting data on physical and performance characteristics at the system, subsystem, component, and soldier levels. Include $P_{k/engagement}$ capability (including target acquisition in clear and degraded environments, system accuracy, and warhead/fuzing effectiveness); countermeasures immunity; physical characteristics; system survivability characteristics; and range capability (minimum and maximum). Desired features such as a remote fire capability shall be addressed.

b. **Volume 2, Section 2, System/Operational Design.** Recommended not to exceed 120 pages. Cover the functional description, interface requirements, physical characteristics, and design configuration for all subsystem and system hardware/software. Include results of early analyses and trade-off considerations. If the Thermal Weapon sight is selected for use by the contractor, a trade-off analysis shall be included which addresses use of the sight as a "strap-on" versus integration of modules. If an alternate night sight is proposed, the contractor shall provide rationale to justify that proposal. Address the operational characteristics of the proposed system and indications of compatibility with existing infantry units. Address ILS effort to include LSA and publications.

c. **Volume 2, Section 3, Test and Evaluation.** Recommended not to exceed 90 pages. Provide a top-level contractor Test Plan which clearly delineates (for system level and subsystem, component, and soldier testing) the hardware quantities, hardware configurations for test, proposed use of facilities, instrumentation, and personnel and other requirements in sufficient detail to provide proposal evaluators a clear understanding of the approach to be taken to meeting the requirements of this solicitation. Support to government tests shall be included. A complete list of the hardware quantities and scheduled utilization, to include GFE to conduct the test program will be furnished. The government approved TEMP is available and will be used for planning/scheduling.

L.15.1.3 **Volume 3, MANPRINT One (1) volume, recommended not to exceed 100 pages as follows:**

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a. **Volume 3, Section 1, MANPRINT Organization and Management.** The offeror shall highlight the following in this part of this proposal:

(1) Description of corp[illegible]nent to MANPRINT.

(2) Identification of re[illegible]uthorities of all MANPRINT management personnel. Include [illegible]rial policies or procedures which ensure the availability of [illegible]onnel required and internal procedures for the resolu[illegible]icts involving design and supportability issues.

(3) Identification of generic qualification for selection of full and part time MANPRINT management personnel.

(4) Description of interface and approval levels of MANPRINT elements with other program elements (e.g., design engineering, RAM, ILS and Quality Assurance).

(5) Identification of procedures to ensure the integration of the six MANPRINT domains with each other as well as the early integration of MANPRINT into the design process. (e.g., participation in design reviews, design criteria, trade study methodology, and common data bases). This should include procedures to identify and resolve conflicts among the six MANPRINT domains and between MANPRINT and other programs.

b. **Volume 3, Section 2, MANPRINT Planning.** The offeror shall provide a MMMP detailing the approach taken by the offeror in his MANPRINT program to satisfy requirements of the SOW and System Specification. The offeror's MANPRINT Program Plan shall include a description of analyses of MANPRINT parameters in order to improve total system performance (effectiveness and availability). The offeror shall describe the conduct of trade-off and sensitivity analyses to determine design alternatives and arrive at the most cost-effective military organization for the operation, maintenance and support of the desired weapon system. An HFE Program Plan, a System Safety Program Plan and a proposed program for assessing biomedical and health hazards shall be provided as a part of this section.

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c. **Volume 3, Section 3, Integrated Training System Plan (ITSP).** The offeror shall submit a comprehensive ITSP that shall describe in as much detail as possible the contractor's approach to satisfying System Specification requirements relating to the following areas:

(1) Institutional Training
(2) Non-institutional Training
(3) Embedded Training
(4) Training Devices
(5) Hands-on Training

L.15.1.4 **Volume 4, Program.** One (1) volume, recommended not to exceed 120 pages, as follows:

a. **Volume 4, Section 1, Master Program Plan.** This plan shall be submitted as part of the proposal and shall define the development phase. Address SOW, top level contractor test planning, software development plan, configuration management, RAM, ILS, MANPRINT, and producibility analysis.

b. **Volume 4, Section 2, Management.**

(1) **Volume 4, Section 2, Part A, Transitioning to Production and Fielding.** This section shall address how well the contractor's history supports his ability to plan and execute transition to production and planning for ILS.

(2) **Volume 4, Section 2, Part B, Production and ILS Management.** This section will address the offeror's ability to plan, establish, and execute an effective production program.

(3) **Volume 4, Section 2, Part C, Personnel.** Address key managerial and technical personnel, **including MANPRINT personnel,** to be assigned to the program including resumes of education and experience.

L.16 through L.17 (Omitted from example)

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SECTION M

EVALUATION AND AWARD FACTORS

DAAHB02-87-R-0001

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SECTION M - EVALUATION AND AWARD FACTORS

M.1 **Clauses Incorporated by Reference.** (Omitted from example)

M.2 **Notice of Basis for Equitable Evaluation of Use of Government-Owned Production and Research Property.** (Omitted from example)

M.3 **Basis for Award.**

M.3.1 **Evaluation Guidance.** Proposals will be evaluated in accordance with DoD Directive 4105.62 dated 9 September 1985. In the course of the source selection process, evaluators will be examining the adequacy of contractors' proposal in various areas. Unless otherwise specified, adequacy shall be as determined by the SSEB Chairman.

M.3.2 **Evaluation Concept.** The underlying thrust of this solicitation, and the basis for the evaluation factors below, is to select candidate(s) for Development and Prove-Out that have the highest likelihood of defeating the postulated future soviet tank (FST) threat at least risk, with adequate operational suitability, **MANPRINT**, and the best potential for subsequent P^{3}I improvements in penetration capability and accuracy, within the specified size and weight.

M.4 **Evaluation Approach.** Proposals evaluation will be divided into Technical and Operational Suitability, **MANPRINT**, Cost, and Management. Technical and operational suitability will be heaviest weighted. **MANPRINT** and Cost are separate, equal major evaluation factors and are important for their design implications. Management will be the least heavily weighted factor.

M.4.1 **Technical and Operational Suitability.** The strongest emphasis will be given to the Technical and Operational Suitability area which is composed of the following three elements (in decreasing order of importance):

a. **Manned** System Operational Performance

b. **Manned** System Design

c. Test and Evaluation.

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M.4.1.1 **Manned System Operational Performance.** Evaluation of this element shall consider the following five factors in decreasing order of importance:

a. $P_{k/engagement}$ capability (includes target acquisition in clear and degraded environments, manned system accuracy, and warhead/fuze effectiveness)

b. Countermeasures Immunity

c. Physical Characteristics (includes portability)

d. Survivability

e. Range.

Subfactors in decreasing order of importance for all of the above include existing data in the form of test data and analyses, analytical methodology, and simulation plans and program.

M.4.1.2 **Manned System Design.** This element shall be evaluated for the following six factors in decreasing order of importance:

a. Round Design

b. Command and Launch Unit (CLU) Design

c. Integrated Logistics Support (ILS)

d. Preplanned Product Improvement.

Subfactors in decreasing order of importance for round and CLU design include maturity of technology, adequacy of engineering analyses to support construction of functional prototypes, definition of and corrective measures to reduce known risk in areas of technical, performance, schedule, RAM, and producibility, and completeness of description. Subfactors in decreasing order of importance for ILS are LSA, publications, and training.

M.4.1.2.1 **Round Design.** (Omitted from example)

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M.4.1.2.2 **Command and Launch Unit (CLU) Design.** (Omitted from example)

M.4.1.2.3 **Integrated Logistics Support.** (Omitted from example)

M.4.1.2.4 **Preplanned Product Improvement.** (Omitted from example)

M.4.1.3 **Test and Evaluation.** This element shall be divided into System Testing and Subsystem/Component Testing which are of equal importance. Subfactors of equal importance for System Testing include adequacy of proposed tests; efficient use of facilities, equipment, and personnel; and extent of government test and evaluation support required. Subfactors of equal importance for Component Testing include adequacy of proposed tests; efficient use of facilities, equipment, and personnel; critical component/subsystem performance tests; limited environmental tests; and extent of government test and evaluation support required.

M.4.2 **MANPRINT. MANPRINT shall be evaluated in three stages. First, application of management criteria will focus on the offeror's initial competence in carrying out a MANPRINT program. Second, domain criteria will examine the six traditional MANPRINT domains separately. Finally, systems integration criteria will look at the system as a whole and examine its subsystem interactions and relations to higher-level goals.**

M.4.2.1 **Management. The evaluation of this element shall consider the following five factors in the offeror's proposal in decreasing order of importance.**

a. Concept for incorporating MANPRINT into system design. The adequacy of the offeror's concept for assuring that the system design will reflect MANPRINT goals and constraints shall be evaluated.

b. Proposed MANPRINT Organization. The offeror's proposed MANPRINT organization, level of effort, lines of authority, visibility to top-management and potential impact on assuring MANPRINT design influence shall be evaluated.

c. Concept for the MMMP. The depth and credibility for developing a Manufacturer's MANPRINT Management Plan based on requirements in the SOW shall be evaluated.

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d. **Dedicated MANPRINT Personnel.** The capability of the offeror's personnel (including key subcontractor personnel) for performing the MANPRINT tasks required by the SOW shall be evaluated.

e. **Cost.** The adequacy of the offeror's cost analysis in relation to MANPRINT areas outlined in the SOW shall be evaluated.

M.4.2.2 **Domains.** The six MANPRINT domains, each of equal importance and each with separate criteria, shall be evaluated as follows:

M.4.2.2.1 **Manpower.** The evaluation criteria for this domain, in decreasing order of importance shall be (a) Analyses, and (b) Understanding force structure concepts.

a. **Analyses.** The credibility and depth of detail with which the contractor proposes to conduct trade-off and sensitivity analyses and subsequently apply the results shall be evaluated.

b. **Understanding force structure concepts.** The contractor's understanding of force structure constraints and ability to analyze system impact on the current force, using appropriate outputs of ECA, HARDMAN analysis and BOIP/QQPRI data shall be evaluated.

M.4.2.2.2 **Personnel.** The evaluation of this domain shall consider the following criteria in decreasing order of importance: (a) Responsiveness to the RFP, and (b) Analyses.

a. **Responsiveness to the RFP.** The offeror's compliance with and response to the constraints and guidance provided in the SOW and ZAP4000 shall be evaluated.

b. **Analyses.** The credibility and depth of detail with which the contractor proposes to conduct trade-off and sensitivity analyses to determine the aptitude requirements of his design shall be evaluated.

M.4.2.2.3 **Training.** The evaluation criteria for this domain shall be (a) Analyses, (b) Training Concepts, and (c) Integration, in decreasing order of importance.

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a. **Analyses.** The credibility a[illegible] depth of detail with which the offeror proposes to conduct trade-off and s[illegible]itivity analyses to design his training program to produce the required l[illegible] an performance from the soldiers in the Target Audience Description [illegible]AD).

b. **Training Concepts.** The contractor's ability to plan, establish and implement and Integrated Training System Package to support institutional and non-institutional training shall be evaluated. The offeror's analysis of system training requirements throughout the total force using ICTP, Service School Surveys, task analyses, and other appropriate data shall also be analyzed.

c. **Integration.** The offeror's understanding of and coordination with other domains of MANPRINT such as Manpower and Personnel as well as other programs such as ILS, shall be evaluated.

M.4.2.2.4 **Human Factors Engineering.** The evaluation criteria for this domain in decreasing order of importance shall be (a) Responsiveness to the RFP, (b) Credibility of Proposal, and (c) Management.

a. **Responsiveness to the RFP.** The offeror's compliance with and response to the constraints and guidance provided in the SOW and ZAP4000 shall be evaluated.

b. **Credibility of Proposal.** The contractor's depth of planning, implementation of procedures, methods of controlling costs, and level of detail shall be evaluated.

c. **Management.** The offeror's approach in identifying and documenting functional and physical characteristics of the system, controlling changes and maintaining and reporting status accounting shall be evaluated.

M.4.2.2.5 **System Safety.** The criteria for System Safety evaluation are of equal importance and include (a) identification of risks and impact, and (b) Credibility of Proposal.

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a. **Identification of Risks and Impact.** The offeror's approach to identify and respond to system safety risks in system design shall be evaluated.

b. **Credibility of Proposal.** The offeror's depth of planning and implementation of procedures shall be evaluated.

M.4.2.2.6 **Health Hazard Assessment.** The evaluation of this domain shall consider (a) Responsiveness to the RFP, and (b) identification of risks and impact. Both shall be of equal importance.

a. **Responsiveness to the RFP.** The offeror's compliance with and response to constraints and guidance provided in the SOW and ZAP4000 shall be evaluated.

b. **Identification of Risks and Impact.** The offeror's approach to identify and respond to health hazards in system design shall be evaluated.

M.4.2.3 **System Integration.** The criteria for an overall evaluation of MANPRINT in decreasing order of importance shall be (a) Soldier-Machine Interface, (b) Analyses, (c) Feedback, (d) Coordination, and (e) Data Collection.

a. **SMI.** The adequacy of the contractor's procedures for integrating soldier and machine within the system (e.g., relating engineering decisions to soldier performance) shall be evaluated.

b. **Analyses.** The offeror's approach using trade-off analysis and sensitivity analysis to consider design alternatives and identify performance measures among functional areas (e.g., MANPRINT vs. Technical) shall be evaluated.

c. **Feedback.** The offeror's efforts to provide feedback between system design and MANPRINT analysis, particularly early in the design phase to assist resolution of problems, shall be evaluated.

d. **Coordination.** The means and procedures proposed by the contractor for coordination, sharing data and avoidance of duplication among ILS, RAM, and MANPRINT programs.

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e. **Data Collection.** The contractor's procedures for fundamental data collection and analyses commonly shared by all MANPRINT domains shall be evaluated.

M.4.3 Cost. (Omitted from example)

M.4.4 **Management.** The Management will be the least heavily weighted factor. Evaluation shall consider the following five elements in decreasing order of importance:

a. Management Structure and Past Performance

b. System Engineering Management

c. Configuration Management

d. Past Performance in Transitioning from Development into Production/Fielding

e. Production

M.4.4.1 **Management Structure and Past Performance.** (Omitted from example)

M.4.4.2 **System Engineering Management.** The approach taken to integrate the system engineering effort will be evaluated.

M.4.4.3 **Configuration Management.** (Omitted from example)

M.4.4.4 **Transitioning to Production and Fielding.** This element will evaluate the contractor's recent auditable record to be submitted by the offeror in his response to this RFP, on similar programs of his ability to prepare for and accomplish smooth transition from Development/Proveout to Production and Deployment. Evidence should also be presented of the contractor's ability to provide timely and complete technical documentation packages prior to the end of Development/ Proveout.

M.4.4.5 **Production.** This element will evaluate the contractor's auditable record, to be submitted by the offeror in his proposal, on similar programs of his ability to plan, establish and implement effective production.

EXHIBIT A

CONTRACT DATA REQUIREMENTS LIST

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(Note: This example Contract Data Requirements List (CDRL) is limited to those items with a relationship to the MANPRINT process. A complete CDRL for the actual procurement of a major weapon system will be considerably longer. As noted earlier in this handbook, many Data Item Descriptions (DIDs) must be tailored for your specific application.)

CONTRACT DATA REQUIREMENTS LIST

ATCH NR ____ TO EXHIBIT A

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CATEGORY A & H

SYSTEM/ITEM ZAPPER

CONTRACTOR ____

1. SEQUENCE NUMBER	2. TITLE OR DESCRIPTION OF DATA / 3. SUBTITLE	4. AUTHORITY (Data Item Number)	5. CONTRACT REFERENCE	6. TECHNICAL OFFICE	7. DD 250 REQ	8. Rec Code (A)	9. Agency to Use (S)	10. FREQUENCY	11. AS OF DATE	12. DATE OF 1ST SUBMISSION	13. DATE OF SUBSEQUENT SUBM/EVENT (B)	14. DISTRIBUTION AND ADDRESSEES (Addressee – Regular Copies/Reproducible Copies)	15. TOTAL
A001	Progress Report; Monthly Progress Report	DI-A-5009A	SOW 3.4.3	AMCPM-Z	LT			Mthly	-	30 DAC	See 16	AMCPM-Z	30/0
A002	Progress Report; Final Progress Report	DI-A-5009A	SOW 3.4.3	AMCPM-Z	LT	A		One/R		50 days prior to EOC	See 16	AMCPM-Z AMCPM-Z	Draft 10/0 Draft 30/0
A003	Explosive Hazard Classification Data	DI-H-1321B	SOW 3.3.7.1.3	AMCPM-Z	LT	A		One/R		See 16	See 16	AMCPM-Z	5/1
A004	Surface Danger Area Data; DD Form 1921-3	DI-H-1327A	SOW 3.3.7.1.2	AMCPM-Z	LT	A		One/R		See 16	See 16	AMCPM-Z	5/1

16. REMARKS

A001: This report shall be a letter report due 10 days after end of reporting period.

A002: The draft will require 30 days for government review. The final report shall be submitted within 20 days after the government-approved draft is returned to the contractor.

A003: Submit 45 days prior to explosives shipment to government facility. Government requires 5 days for review.

A004: Submit 30 days prior to tests at government facilities. Government requires 15 days for review.

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CONTRACT DATA REQUIREMENTS LIST

CATEGORY H

SYSTEM/ITEM ZAPPER

CONTRACTOR ____

1. SEQUENCE NUMBER	2. TITLE OR DESCRIPTION OF DATA / 3. SUBTITLE	4. TECHNICAL OFFICE	10. FREQUENCY	12. DATE OF 1ST SUBMISSION	14. DISTRIBUTION AND ADDRESSEES (Addressee — Regular Copies/Reproducible Copies)
	6. AUTHORITY (Data Item Number) / 5. CONTRACT REFERENCE	7. DD250 REQ / 8. Rep code (a) / 9. Govt furnish (b)	11. AS OF DATE	13. DATE OF SUBSEQUENT SUBM/EVENT ID	
A005	Radioactive Material Data	AMCPM-Z	One/R	See 16	16. AMCPM-Z 5/0
	DI-H-1332A / SOW 3.8.7.2.3	LT / A			
	16. REMARKS: Submit data 30 days after PDR. Government requires 30 days for review.			See 16	17. TOTAL
A006	Noise Measurement Report	AMCPM-Z	One/R	See 16	16. AMCPM-Z 1/0
	DI-H-1336 / SOW 3.8.7.2.1	LT / A			
	16. REMARKS: Draft to be submitted NLT 30 days after completion of test. Government requires 60 days for review. Final to be submitted 30 days after receipt of Government comments. If efficient use of testing facilities			See 16	17. TOTAL
	16. REMARKS (DI-H-1336 con'd): or availability of test items requires incremental testing and reporting, the same schedules for reporting, review and resubmission shall be followed as for a single test.			See 16	17. TOTAL
A007	Manufacturer's MANPRINT Mgmt. Plan (MMMP)	AMCPM-Z	One/R	See 16	16. AMCPM-Z Draft 10/0 Final 10/0
	OT-11920 / SOW 3.8.1	LT / A			
	16. REMARKS: Initial submission with proposal. First revision due 30 DAC. Government requires 30 days for approval. Revision due at 6 month intervals or 15 days after changes in related plans. Related plans, Human Engineering			See 16	17. TOTAL

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1. Sequence Number	2. Title or Description of Data / 3. Subtitle / 4. Authority (Data Item Number)	5. Contract Reference	6. Technical Office	7. DD250 REQ	8. App Code	9. Input to IAC	10. Frequency / 11. As of Date	12. Date of 1st Submission / 13. Date of Subsequent Subm/Event ID	14. Distribution and Addressees (Addressee—Regular Copies/Repro Copies)	15. Total
	16. Remarks (DI-11920 con'd) Program Plan (DI-H-7051); Training and Training Equipment Plan (DI-H-7066); and System Safety Program Plan (DI-SAFT-80100) may be included by reference.									
A008	Human Engineering Program Plan / DI-H-7051	SOW 3.8.6.1	AMCPM-Z	LT	A		One/R	See 16 / See 16	AMCPM-Z	1/0
	16. Remarks: Submit with proposal. Government requires 30 days for review. Final to be submitted 30 DAC.									
A009	Human Engineering Dynamic Simulation Plan / DI-H-7052	SOW 3.5.2.2.1	AMCPM-Z	LT	A		One/R	See 16 / See 16	AMCPM-Z	1/0
	16. Remarks: Draft to be submitted 60 DAC. Government requires 30 days for review. Final to be submitted 30 days after receipt of Government comments.									
A010	Human Engineering Test Plan / DI-H-7053	SOW 3.8.6.3.3	AMCPM-Z	LT	A		See 16	See 16	AMCPM-Z	1/0
	16. Remarks: Draft to be submitted 120 days prior to testing. Government requires 60 days for review. Final to be submitted 30 days after receipt of Government comments.									

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4. AUTHORITY (Data Item Number)	5. CONTRACT REFERENCE	7. DD250 REQ / 8. Cap Code (A) / 9. Distribution	11. AS OF DATE	13. DATE OF SUBSEQUENT SUBM/EVENT ID	
A011	Human Engineering Design Approach Document-Operator	AMCPM-Z	One/R	See 16	14. AMCPM-Z 1/0
DI-H-7056	SOW 3.8.6.3.2	LT / A		See 16	15. TOTAL
16. REMARKS: Draft to be submitted 120 DAC. Government requires 60 days for review Final to be submitted 90 days after receipt of Government comments.					
A012	Human Engineering Design Approach Document-Maintainer	AMCPM-Z	One/R	See 16	14. AMCPM-Z 1/0
DI-H-7057	SOW 3.8.6.3.1.6	LT / A		See 16	15. TOTAL
16. REMARKS: Draft to be submitted 120 DAC. Government requires 60 days for review. Final to be submitted 90 days after receipt of Government comments.					
A013	Human Engineering Test Report	AMCPM-Z	See 16	See 16	14. AMCPM-Z 1/0
DI-H-7058	SOW 3.8.6.3.3	LT / A			15. TOTAL
16. REMARKS: Draft to be submitted 30 days after completion of test, Government requires 30 days for review. Final to be submitted 30 days after receipt of Government comments. If tests done incrementally, draft incremental report shall be submitted, reviewed and resubmitted according to the same					
					15. TOTAL
					15. TOTAL
16. REMARKS: (DI-H-7058 con'd) schedule as for single test.					

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a. A014	b. Human Engineering Test Report; c. Soldier Performance Measurement Report	d. DI-H-7058	e. System Spec. 4.1.2.1.1	f. AMCPM-Z / LT	g. A	h.	i. One/R	j.	k. See 16	l. See 16	m. AMCPM-Z	Draft 5/0 Final 5/0
n. REMARKS: Draft report due 30 days after test completion. Government requires 30 days for review. Final report due 60 days after receipt of government comments.												
a. A015	b. Human Engineering Progress Report c.	d. DI-H-7058	e. System Spec. 4.1.2.1.4	f. AMCPM-Z / LT	g. A	h.	i. Mthly	j.	k. See 16	l. See 16	m. AMCPM-Z	1/0
n. REMARKS: To be submitted in accordance with DI-H-7059 as a separately identifiable section of DI-A-3008A.												
a. A016	b. Training and Training Equipment Plan c.	d. DI-H-7058	e. SOW 3.8.5 System Spec. 3.6.3	f. AMCPM-Z / LT	g. A	h.	i. See 16	j.	k. See 16	l. See 16	m. AMCPM-Z	Draft 10/0 Final 10/0
n. REMARKS: Deliver plan outline 60 days after contract award. Deliver plan 12 months after contract award and update as required. Government approval/ disapproval within 60 days.												
a. A017	b. Training Course/Curriculum Outlines; c. Test Personnel Training	d. DI-H-7058	e. SOW 3.8.5.2	f. AMCPM-Z / LT	g.	h.	i. See 16	j.	k. See 16	l. See 16	m. AMCPM-Z	10/0
n. REMARKS: Outline shall be delivered NLT 60 days prior to start of training												

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A018	Audiovisual Aids Master Reproducibles and Review Copies for Tng Eqpt and Tng Courses	DI-H-7072	System Spec. 3.6.3.4	AMCPM-Z	LT	A		One/R		See 16	See 16	AMCPM-Z	Draft 5/0 Final 5/1 TOTAL
A019	Instructor's Utilization Handbook for Simulation Equipment	DI-H-7076	System Spec. 3.6.3.4(b)	AMCPM-Z	LT	A		One/R		See 16	See 16	AMCPM-Z	Draft 5/0 Final 5/1 TOTAL
A020	Technical Publications for Advanced Dev. Prog. * System Operating Instructions	DI-M-6157	SOW 3.7.2	AMCPM-Z	LT			One/R		See 16	See 16	AMCPM-Z	Draft 15/0 TOTAL
	NOT USED												TOTAL

16. REMARKS

A018: Deliver draft courseware for government review 12 MAC. Government approval/disapproval within 60 days. Deliver final training course 16 MAC.

A019: Deliver draft 12 MAC. Government requires 60 days for review. Deliver final Handbook 16 MAC.

A020: System Operating Instructions shall be delivered 60 days prior to start of training.

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CONTRACT DATA REQUIREMENTS LIST

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SYSTEM/ITEM ZAPPER

CONTRACTOR ____

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6. AUTHORITY (Data Item Number)	7. CONTRACT REFERENCE	8. APP CODE (A) / 9. DIST STMT (B)	11. AS OF DATE	13. DATE OF SUBSEQUENT SUBMISSION/EVENT ID	
A021	System/Design Trade Study Reports	AMCPM-Z	See 16	See 16	A AMCPM-Z Draft 5/0 Final 5/1
DI-S-3606	SOW	LT	See 16	See 16	AMCPM-Z Draft 5/0 Final 5/1
					AMCPM-Z Draft 5/0 Final 5/1
					15. TOTAL

16. REMARKS

A. Alternative Design Trade-Off Report: BLK 10 ONE/R, BLKS 11, 12, 13 see 16, BLK 15 initial submission 6 MAC and thereafter 15 days after completion of each analysis. Final report due 12 MAC.

B. Fuzing Effectiveness Report: BLK 10 ONE/R, BLKS 11, 12, 13 see BLK 16. BLK 16 submit report 15 days after completion of analysis. Government requires 30 days for review. Final report due 90 days after receipt of comments.

C. Personnel Trade-Off Analysis Report: BLK 10 ONE/R, BLK 11, 12, 13 see BLK 16. Blk 16 initial submission 6 MAC and thereafter 15 days after completion of each analysis. Final report due 12 MAC.

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CATEGORY S & T

SYSTEM/ITEM ZAPPER

CONTRACTOR ____

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A022	Scientific and Technical Reports; System Battlefield Performance Analysis	DI-S-4057	SOW 3.5.2.5	AMCPM-Z	LT A	One/R		18 MAC	See 16	AMCPM-Z	Draft 5/0 Final 10/1
A023	Scientific and Technical Reports; System Flight Performance and Accuracy	DI-S-4057	SOW 3.5.2.2	AMCPM-Z	LT	See 16		120 DAC	See 16	AMCPM-Z	Draft 5/0
A024	Scientific and Technical Reports; Aptitude Level Report	DI-S-4057	SOW 4.1.2.1.2	AMCPM-Z	LT A	One/R		See 16	See 16	AMCPM-Z	Draft 5/0 Draft 5/0
A025	Engineer Design Test Plan; Contractor Test Program Plan	DI-T-1901	SOW 3.2.1	AMCPM-Z	LT A	One/R	See 16	See 16	See 16	AMCPM-Z	Draft 5/0

16. REMARKS

A022: Government will require 10 days to review each draft report. Final report shall be submitted within 15 days after the government-approved draft is reported to the contractor.

A023: Report shall be updated monthly. Longer intervals are acceptable if bias precision, or total CEPs have not changed greater than 10 cm from last report.

A024: Draft report due 30 days after test completion. Government requires 30 days for review. Final report due 60 days after receipt of government comments.

A025: Due 120 days prior to test start. Government approval/disapproval with inputs to contractor to be provided within 30 days after submission. Update to plans due 30 days after receipt of Government inputs.

PREPARED BY	DATE	APPROVED BY	DATE

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CONTRACT DATA REQUIREMENTS LIST

CATEGORY ILSS & SAFT

SYSTEM/ITEM ZAPPER

CONTRACTOR ____

1. SEQUENCE NUMBER	2. TITLE OR DESCRIPTION OF DATA / 3. SUBTITLE	5. TECHNICAL OFFICE	10. FREQUENCY	12. DATE OF 1ST SUBMISSION	14. DISTRIBUTION AND ADDRESSEES (Addressee – Regular Copies/Repro Copies)
4. AUTHORITY (Data Item Number)	6. CONTRACT REFERENCE	7. DD250 REQ / 8. App Code (A) / 9. Applic to I&C (X)	11. AS OF DATE	13. DATE OF SUBSEQUENT SUBM/EVENT ID	
A026	Training Course Standards	AMCPM-Z	One/R	See 16	AMCPM-Z 5/0
DI-ILSS-80047	System Spec.4.1.2.1.3	LT / A		See 16	15. TOTAL
16. REMARKS: Submit 30 days prior to start of testing involving soldiers. Government requires 15 days for review.					
A027	Manpower, Personnel and Training Analysis Report	AMCPM-Z	One/R	See 16	AMCPM-Z Draft 5/0 Final 10/1
DI-ILSS-8007	SOW 3.8.3	LT		See 16	15. TOTAL
16. REMARKS: Initial submission 6 MAC with revision as analyses are completed. Final report provided 18 MAC.					
A028	System Safety Program Plan	AMCPM-Z	One/R	See 16	AMCPM-Z Draft 5/0 Final 10/1
DI-SAFT-80100	SOW 3.8.7.3,3.8.7.1.1	LT / A		See 16	15. TOTAL
16. REMARKS: Initial submission with proposal. Update as required. Government requires 30 days for review.					
A029	System Safety Hazard Analysis Report	AMCPM-Z	One/R	See 16	AMCPM-Z Draft 5/0 Final 1/1
DI-SAFT-80101	SOW 3.8.7.1.1	LT / A		See 16	15. TOTAL
16. REMARKS: Submit not later than 90 days prior to tests on Government facilities. Update prior to manned firings and other times as required. Government requires 30 days for review.					

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4. AUTHORITY (Data Item Number)		5. CONTRACT REFERENCE	7.	8.	9.	11. AS OF DATE	13. DATE OF SUBSEQUENT SUBM/EVENT ID		
A030	Safety Assessment Report		AMCPM-Z			One/R	See 16	AMCPM-Z	Draft 5/0, Final 5/1
SI-SAFT-80102		SOW 3.8.7.1.1	LT	A			See 16	15. TOTAL	
16. REMARKS: Initial submission 120 days prior to start of testing. Government requires 60 days for review.									
A031	System Safety Program Progress Report		AMCPM-Z			See 16	60 DAC	AMCPM-Z	Draft 5/0
DI-SAFT-80105		SOW 3.8.7.1.1	LT				See 16	15. TOTAL	
16. REMARKS: Submit in accordance with DI-SAFT-80105 as a separately identifiable section of DI-A-5009A.									
	NOT USED								
								15. TOTAL	
16. REMARKS									
	NOT USED								
								15. TOTAL	
16. REMARKS									

PREPARED BY ____ DATE ____ APPROVED BY ____ DATE ____

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DATA ITEM DESCRIPTION	Form Approved OMB No. 0704-0188 Exp. Date: Jun 30, 1986
1. TITLE: Manufacturer's MANPRINT Management Plan	2. IDENTIFICATION NUMBER: DT-11920

3. DESCRIPTION/PURPOSE
The Manufacturer's MANPRINT Management Plan (MMMP) is the single document which describes the contractor's entire MANPRINT program, identifies its elements and explains how the elements will be managed. This document is used by the procuring activity as the principal basis for approval of the contractor's program and as one basis for review of the contractor's progress.

4. APPROVAL DATE (YYMMDD)	5. OFFICE OF PRIMARY RESPONSIBILITY (OPR)	6a. DTIC REQUIRED	6b. GIDEP REQUIRED
	A/AMCPM-Z		

7. APPLICATION/INTERRELATIONSHIP

7.1 This data item description contains the format and content preparation instructions for the data product generated by the specific and discrete task requirement for this data included in the contract.

7.2 The Manufacturer's MANPRINT Management Plan is related to DI-H-7051, Human Engineering Program Plan; DI-H-7066, Training and Training Equipment Plan; DI-S-3606 System/Design Trade Study Reports, Personnel Trade-Off Analysis Report; and DI-SAFT 80100, System Safety Program Plan.

8. APPROVAL LIMITATION	9a. APPLICABLE FORMS	9b. AMSC NUMBER
Limited to one-time use for solicitation DAAH02-87-R-0001	MIL-H-46855B MIL-STD-1472	

10. PREPARATION INSTRUCTIONS

10.1 Contract. This data item is generated by the contract which contains a specific and discrete work task to develop this data product.

10.2 Format and Content Requirements. The MMP shall consist of the following:

(1) Table of Contents, List of Illustrations and Introduction.

(2) Organization. This section shall identify and describe the contractor's primary organizational element responsible for complying with MANPRINT requirements. The functions and internal structure of this element shall be defined. Structural definition shall include the number of proposed personnel on an annual basis and summary job descriptions for each person. In addition the relationships of this element to other organizational elements responsible for areas impacted by MANPRINT, such as those charged with equipment and software design, test and evaluation, integrated logistic support and other engineering specialty programs (such as reliability, maintainability, survivability, vulnerability, and transportability) shall be fully explained. The authority delegated to each of the elements shall be stated in explaining the relationships. This section shall also describe the methods by which the contractor shall ensure that compatibility is continuously maintained between the design of system hardware and software (including support and training equipment), human performance requirements, manpower and personnel requirements (including aptitude requirements for operators and maintainers), training requirements, system safety requirements, and health hazard limitations.

(3) MANPRINT in Subcontractor Efforts. If any work related to system components or software having human interface safety and/or health hazards implications is to be performed under subcontract, the subcontractor's organizational element

DI-11920

10. PREPARATION INSTRUCTIONS (continued)

responsible for MANPRINT shall be described to the same extent as the prime contractor's MANPRINT organization is covered. A copy of the MANPRINT requirements proposed for inclusion in each of these subcontracts shall be provided. The method(s) by which the prime contractor monitors subcontractor compliance shall be fully described.

(4) MANPRINT in System Analysis. This section shall identify those MANPRINT efforts in system analysis (or, where contractually required, in system engineering), which are contractually applicable and the organizational element(s) responsible for their performance. MANPRINT participation in system mission analysis, determination of system functional requirements and capabilities, allocation of system functional requirements to human/hardware/software, determination of aptitude requirements for operators and maintainers, development of system functional flows and performance of system effectiveness studies shall be fully described. Any data required from the procuring activity shall be described.

(5) MANPRINT in Equipment Detail Design. This section shall describe the effort in equipment detail design to ensure compliance with requirements specified by the contract. MANPRINT participation in studies, tests, mock-up evaluations, dynamic simulation, detail drawing reviews, systems design reviews and system/equipment/component design and performance specification preparation and reviews shall be fully described.

(6) MANPRINT in Test and Evaluation. This section shall describe MANPRINT test and evaluation as an integrated effort within the contractor's total test and evaluation program and shall contain specific information to show how and when the contractor shall satisfy test and evaluation requirements of the contract. Design milestones shall be identified at which MANPRINT tests are to be performed to assess compatibility among human performance requirements, personnel aptitude requirements, training and skill requirements, equipment design aspects of personnel equipment/software interfaces, system safety, and elimination and/or control of health hazards. Major test and demonstration objectives shall be identified and proposed test methods shall be described. This section shall also identify the MANPRINT personnel involved in test and evaluation, and summarize the MANPRINT test schedule. The summary test schedule shall depict major MANPRINT evaluations and demonstrations in relationship to major milestones such as 90 percent design release, project level design reviews, first article demonstration tests and commencement of procuring activity testing.

(7) MANPRINT Deliverable Data Products. This section shall identify and briefly describe each MANPRINT deliverable data product specified in the contract.

(8) Time-Phase Schedule and Level of Effort. This section consists of a milestone chart which identifies efforts to be accomplished in each of the six separate MANPRINT domains.

(9) Related Plans. This section shall identify and describe related plans for the six separate MANPRINT domains (Manpower, Personnel, Training, Human Factors Engineering, System Safety, and Health Hazard Assessment). The Human Engineering Program Plan (DI-H-7051), the Training and Training Equipment Plan (DI-H-7066) and the System Safety Program Plan (DI-SAFT-80100) may be included in the MMMP by reference.

ATTACHMENT 03

SYSTEM SPECIFICATION

(ZAP4000)

ZAP4000

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SYSTEM SPECIFICATION

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SYSTEM SPECIFICATION

LIST OF TABLES

1.0 SCOPE. This specification establishes the performance, design, development, and test requirements for the ZAPPER System.

2.0 APPLICABLE DOCUMENTS. (Omitted from example)

3.0 REQUIREMENTS.

3.1 System Definition. The ZAPPER shall be designed to provide a manportable anti-armor system with the capability to defeat the current and projected armor threat into the year 2000. The manned ZAPPER shall have a probability of kill as specified herein, in all battlefield environments including, an electronic, electro-optical countermeasures environment, as stated herein. To reduce gunner vulnerability, the system shall be capable of being fired from enclosures with a reduced signature, increased lethality and at a range twice that of the present standard system. The ZAPPER system shall be lighter, less bulky and require less training than the system currently employed.

3.1.1 General Description. The functional components which comprise the ZAPPER are a round, a command and launch unit, training devices, and intermediate forward test equipment (IFTE), if required.

3.1.1.1 Round. The round is the expendable portion of the weapon. It shall be of the wooden round concept with a shelf life of not less than ten years.

3.1.1.2 Command and Launch Unit (CLU). The CLU is the reuseable portion of the tactical weapon system. It shall have a trigger mechanism built-in test (BIT) and guidance and fire control functions.

3.1.1.3 Peculiar Support Equipment (PSE). PSE, if required at any support level, shall be minimized and shall be justified based on analysis of cost of PSE versus cost of redesign of hardware to eliminate the use of PSE.

3.1.1.4 Training Devices. The Training Devices shall support all phases of training from initial entry training to individual and crew sustainment training at using units.

3.1.2 Missions. The ZAPPER's primary mission is to defeat threat armored vehicles listed in Annex 1 hereto, (not included). Other missions, which shall not degrade the primary mission, include engagement of bunkers, other point targets, and helicopters listed in Annex 5, hereto, (not included). ZAPPER shall significantly increase the combat effectiveness of all infantry units by supplementing the heavy antitank/assault weapon and providing the anti-armor employment dictated by the continued and increasing emphasis on mechanized combat in future warfare.

3.1.3 System Diagram. (Omitted from example)

3.1.4 Interface Definition. The system must be designed giving consideration to the operator and operational interfaces involved.

3.1.5 **Government-Furnished Material.** Omitted from example.

3.1.6 **Operational and Organizational Concepts.** The ZAPPER shall be a manportable system employed by dismounted infantry at platoon level to destroy enemy armor in all theaters of operation. ZAPPER shall be controlled by the platoon leader and employed by the squad leader. Mission assignments shall be made by the platoon leader, and the weapon shall be used for multiple tank engagements. Increased gunner survivability shall be a primary employment consideration. The system launch and all-environment sighting/ surveillance capabilities shall permit firing from protected fighting positions, impose minimum operational constraints and enable targets to be engaged at long ranges in degraded environments.

3.2 **Characteristics.**

3.2.1 **Performance Characteristics.**

3.2.1.1 **User Profile: The design of the system hardware shall conform to the capabilities and limitations of soldier operators and maintainers having the following profiles.**

a. Fully-equipped male soldiers with 5th through 95th percentile physical dimensions with physical profiles 111221 or better and whose aptitudes are as described in para. 3.2.1.8.

b. Have institutional (skill attainment) operational training not exceeding 35 hours (at a cost NTE $1,200 per student in class sizes of 100 students) and unit (skill sustainment) training NTE 15 hours quarterly (at a cost of NTE $400 per student, per platoon).

3.2.1.2 **Employment Time/Rate of Fire.** The employment time for the system shall not exceed 1.5 minutes. Employment time is defined as the time to transition from unassembled carrying mode to ready-to-fire. The maximum time required to go from the standby mode to ready-to-fire shall not exceed 8 seconds, **using soldiers described in the TAD with no more than the institutional training proposed by the contractor.** The time required to cool down the system to a standby mode or go to a ready-to-fire mode again shall not exceed 1.5 minutes. The system rate of fire using one CLU with multiple rounds, shall be no less than 4 rounds per 3 minutes. Rate of fire shall be calculated by using the time from trigger pull to trigger pull while engaging fully exposed stationary targets at 3/4 of the system's maximum range.

3.2.1.3 **Target Engagement Capability.** The time for the manned system to engage a stationary threat target in daylight at one-half the maximum range of the system shall not exceed 30 seconds after correct target identification in a 7-kilometer visibility, non-nuclear benign countermeasures environment. Under NBC, night or other adverse conditions the engagement time shall not exceed 45 seconds after correct target identification.

3.2.1.4 **Hit Probability.** (System Effectiveness). The hit probability (P_h) for the above engagement shall be at least **.81 when calculated by an equation/formula containing one or more specific terms describing the soldier performance of critical operations tasks.** P_h of at least .65 is desired under NBC, night and other adverse conditions. Until test data are available for use in this calculation, a value not to exceed .90 may be substituted for any such term.

3.2.1.5 **Field of View.** To accomplish battlefield surveillance and target acquisition and to provide the gunner the capability to determine that the target can be successfully engaged before being masked by obscuring terrain features, the sighting device shall have a field of view of at least 45 degrees elevation by 90 degrees azimuth. A narrow field of view shall be provided if needed to accomplish recognition out to system maximum range.

3.2.1.6 **System Availability.** System availability (A_m) with **man-in-the-loop** shall be .79 or higher when calculated by the formula in Glossary 1, AR 702-3.

3.2.1.7 **Survivability.**

3.2.1.7.1 **Firing From Enclosures. The manned system shall be capable of firing safely and with no performance degradation from a covered fighting position (one or two-man with openings, front and rear, permitted) and an enclosure of 38.5 cubic meters volume with 2.5 square meters of openings. Toxicity levels shall permit personnel to remain in the enclosure indefinitely after a single firing without exposing them to toxic hazards in excess of those permitted by para 5.13.7.4 of MIL-STD-1472.**

3.2.1.7.2 **Firing Signature.** The weapon firing signature (noise, flash, smoke, backblast) shall be reduced by 35 percent when compared to the current standard system.

3.2.1.7.3 **Gunner Exposure.** The system, whether fire and forget or track after fire, shall show a reduction in gunner exposure time of at least 15 percent when compared to the current standard system. (Exposure is defined as visibility to optically-aided enemy battlefield observation.) Gunner exposure time includes the period of time during which the gunner acquires a target, performs prefire operations, fires the weapon, tracks the round (if required) and reloads the weapon.

3.2.1.8 **Training. The institutional training program for the ZAPPER gunner shall be geared to the lower 20% of the aptitude range stated in the Target Audience Description and should enable infantry personnel in that aptitude range to achieve the performance standards contained in para. 3.2.1.1 and 3.2.1.4 above. A capability for embedded training with the CLU for critical operations and maintenance tasks is desirable.**

3.2.2 **Physical Characteristics.**

3.2.2.1 **Weight.** The system hardware, which includes one round, the command and launch unit, a carry bag if required, and any other components required to engage a target and perform surveillance for at least four hours, shall weigh 14.5 kg or less (desired) to 19.0 kg (maximum). An add-on remote launch capability from a distance of at least 50 meters with additional weight not greater than 12 kg is desired.

3.2.2.2 **Shape.** The physical shape of hardware components shall provide for ease of soldier portability and be compatible with the fully equipped male soldier population wearing protective clothing.

3.2.2.3 **Length.** The carry length of the largest system hardware component shall not exceed 120 centimeters.

3.2.2.4 **Diameter.** The diameter of the round including protective caps shall not exceed 23 centimeters with 21 centimeters desired.

3.2.2.5 **Transport and Storage.** The system hardware/software components shall be capable of transport and storage in the Bradley Fighting Vehicle (BFV), High Mobility Multipurpose Wheeled Vehicle (HMMWV), and (USMC Light Armored Vehicle (LAV)). The round shall be compatible with the storage racks on the BFV, HMMWV, and LAV with the CLU in an appropriate mount. When tactically packaged, it shall be transportable without damage by rail, air, marine, or truck and in tactical wheeled and tracked vehicles over rough terrain and air dropped as equipment carried by individual parachutists or in resupply bundles without degradation in performance resulting therefrom. Tactical packaging shall allow full deployment of the weapon within 90 seconds.

3.2.2.6 **Health and Safety.** The design of the system shall consider optimum safety of personnel when transporting, storing, operating, and maintaining the ZAPPER. The system shall conform to the health and safety requirements of paragraphs 4, 5.13.2.2, 5.13.5.1, and 5.13.7, MIL-STD-1472 and paragraph 5.4, MIL-STD-1474.

3.2.2.7 **Human Performance/Human Engineering.** The design, selection, and arrangement of equipment shall be such as to ensure use, efficiency and safety of operation in performance of all necessary functions by operational and maintenance personnel. The human factors engineering requirements of paragraphs 5.6.5.9, and 5.11 of MIL-STD-1472 as appropriate to the ZAPPER, shall apply. In particular, the design of the system shall be compatible with personnel wearing NBC and cold weather protective clothing and shall provide the means to facilitate carry by the individual infantryman through mountainous and jungle terrain.

3.2.3 **Maintainability.**

3.2.3.1 **Round.** The round is considered a "wooden round" and shall have no maintainability requirements associated with field repair other than cleaning.

3.2.3.2 **Command and Launch Unit (CLU).** The CLU Mean-Time-To-Repair (MTTR)

shall not exceed one hour at the Intermediate Level. No more than 30% of the total maintenance actions shall occur at the Intermediate Level. MTTR includes time to fault-isolate, repair and verify, or test. If Intermediate Level repair is not possible, Operational Readiness Floats (ORF) or Repairable Exchange (RX) shall be used to maintain operational availability. The Unit/Intermediate maintenance level shall be designed to reduce operation and support (O&S) costs by at least 30% (50% desired) when compared to the predecessor system. Use of standard automatic test equipment or suitable alternatives shall be considered as acceptable options.

3.2.3.2.1 **Maintainability.** Maintainability characteristics shall be emphasized. Design shall stress ready access and ease of replacement of line replaceable units (LRUs). When possible, expensive components or assemblies shall be easily removable from disposable LRUs. LRU removal shall require no special tools and shall not require removal of other LRUs to gain access.

3.2.3.2.2 **Intermediate Forward Test Equipment (IFTE).** If IFTE is required, CLU LRU input/output signals shall be made available to test connectors on the CLU case. The applicability of IFTE shall be determined based on intermediate level manpower availability for the predecessor system under the AOE.

3.2.3.3 **Support System.**

3.2.3.3.1 **Crew and Proficiency Trainers.** This equipment shall be maintainable by intermediate level (IL) test equipment.

3.2.3.3.2 **Intermediate Level.** Intermediate level test equipment, if required, shall be supported to the maximum extent possible by using MTOE tools, TMDE, and other existing support equipment.

3.2.3.4 **Maintenance Characteristics.** The maintenance characteristic for ZAPPER shall be as follows:

3.2.3.4.1 **Modular Design.** The modular design (IAW MIL-STD-2165) of the electronic equipment for ZAPPER shall permit easy identification and replacement of defective assemblies. Maximum use shall be made of plug-in/pull-out type components to facilitate removal/replacement.

3.2.3.4.2 **Throwaway Concept.** Based upon logistic support analysis and cost effectiveness studies, items shall be designated as "throwaway," if appropriate.

3.2.3.4.3 **Test Points.** Quick connect/disconnect test point terminals shall be incorporated in system equipment design and shall be able to interface with standard automated test equipment.

3.2.4 **Environmental Conditions.** The system shall perform and be tested IAW environmental conditions shown herein.

3.2.5 **Built-In-Test/Built-In-Test-Equipment (BIT/BITE).** The CLU IFTE and training equipment shall incorporate BIT/BITE to monitor the readiness status of the system and its subassemblies as well as aid in location of failed line replaceable units (LRU's) IAW MIL-STD-415 and MIL-STD-2165. BIT/BITE shall be incorporated into system hardware in such a manner that specific system failures are detectable **by the operator or support maintenance personel with no more than the institutional training proposed by the contractor,** and can be isolated 95 percent of the time to an ambiguity group not to exceed one LRU at the intermediate level support group.

3.3 **Design and Construction.**

3.3.1 **Materials, Processes, and Parts.** (Omitted from example)

3.3.2 **Electromagnetic Radiation.** (Omitted from example)

3.3.3 **Nameplates and Product Marking.** (Omitted from example)

3.3.4 **Workmanship.** (Omitted from example)

3.3.5 **Interchangeability.** (Omitted from example)

3.3.6 **Biomedical, Health Hazard, and Safety Assessment.**

3.3.6.1 **General Requirements. Safety features shall provide for optimum safety and protection of operator, maintenance personnel, facilities, and the item itself during maintenance, storage and use consistent with mission accomplishment. Design and safety verification shall be accomplished in accordance with the safety criteria contained in MIL-STD-882.**

3.3.6.2 **Critical Hazard. The system shall be designed such that two operator errors, or two equipment failures, or one operator error and one equipment failure occurring simultaneously, shall not produce critical or catastrophic hazards as defined in MIL-STD-882.**

3.3.6.3 **Safety Design Characteristics. Design of the weapon and associated equipment shall enhance safety of personnel and equipment. The weapon design shall include the following characteristics:**

3.3.6.3.1 **Control Switch. Control switches shall be designed, located, and positioned to minimize the probability of inadvertent activation.**

3.3.6.3.2 **Design Safety. Design shall ensure that it is mechanically or electrically impossible to activate controls in improper sequence or to connect components and subsystems improperly.**

3.3.6.3.3 **Multiple Sequential Actions. Multiple sequential actions, not to exceed four, shall be required to launch the missile.**

3.3.6.3.4 **Power/Energy Sources.** Power and stored energy sources shall be isolated from fire controls and circuits until intentionally activated.

3.3.6.3.5 **Round Safety.** The round shall incorporate safety features to protect maintenance personnel, facilities, and the round itself during maintenance.

3.3.6.3.6 **Projectile Impact Safety.** The weapon propulsion section in its tactical launch configuration and the complete round (warhead and propulsion section) in its storage and shipping container may burn but should not detonate or propagate to high order explosion when subjected to bullet impact from armor-piercing and armor-piercing tracer projectiles of 5.56mm, 7.62mm, and 12.7mm caliber fired from a range of 50 meters.

3.3.6.4 **Launch Personnel Safety.** The system hardware shall not adversely subject the gunner to blast, noise, heat, debris, or toxicity from normal launch motor and flight motor firings; from flight motor rupture at ignition; or from warhead detonation at minimum tolerance arming distance. The noise level shall not exceed that specified in paragraph 5.4, MIL-STD-1474.

3.3.6.5 **Launch Safety.** Flight motor ignition shall not be possible prior to safety separation distance from the gunner (as established by the contractor or tests in the preceeding phase) nor so late as to allow ground impact of the air vehicle during normal firing. The Safe and Arm device shall remain locked in a safe position and flight motor ignition prevented for abnormal launch events, such as an eject-only round with associated ground tumbling. Flight motor ignition in tube shall result in locking up the Safe and Arm device in the safe position. The round shall not present any additional hazards in case of hangfire/misfire.

3.3.6.6 **Safety Factors.** After anticipated degradation from environmental conditions and expected shelf life, the launch motor, flight motor, and launch tube shall have safety factors not less than 1.5 times the mean plus three standard deviations of the peak operating pressure. Required proof testing shall be conducted at 1.2 times the mean plus three standard deviations of the peak operating pressure. It is desired that the launch motor design consider a fail-safe mode in the event of launch motor overpressure. Gas systems shall have a minimum burst pressure of four times fill pressure and a proof pressure of 1.5 times normal operating or fill pressure.

3.3.6.7 **Laser Safety.** Design of lasers shall be such that the lowest class possible to perform the intended function shall be utilized and shall meet the safety design requirements specified in MIL-STD-1425.

3.3.6.8 **Electrical Safety.** Personnel and equipment safety shall meet requirements of MIL-STD-454 (requirements 1 and 3).

3.3.6.9 **Electro-Explosive Devices.** Electro-explosive devices critical to safety shall meet the design and performance requirements of MIL-STD-1512 and MIL-I-23659, and shall withstand the following without functioning:

a. Electrostatic discharge of 25,00 volts from a 500 picofarad capacitor through a 500 ohm resistor. This discharge shall be applied between bridge and case and also through the bridge.

b. The greater of one ampere direct current or one watt of power for five minutes applied through the bridge.

3.3.6.10 **Fuze.** The fuze shall meet design requirements of MIL-STD-1316. In addition, the fuze shall meet the following requirements:

a. Provide safety during handling and subnormal air vehicle acceleration.

b. Prevent functioning of its firing circuit upon completion of arming if the graze switch or a segment of the crush switch is closed prior to completion of arming.

3.3.6.11 **Toxic Materials and Carcinogens.** Highly toxic materials and carcinogenic materials shall not be used in the design, maintenance, or support of the system. Moderately toxic materials may be used provided the design and controls preclude personnel from being exposed to environments in excess of those specified in 29 CFR 1910 and other acceptable industrial hygiene standards referenced therein. Except for propellants and explosives, materials shall be used which, when burned or exposed to high temperatures, do not give off toxic fumes or support combustion.

3.3.6.12 **Radioactive Materials.** Radioactive materials used in the system shall be selected to minimize hazard to personnel and must be approved by the government. Request for approval shall contain the design and marking information specified in MIL-STD-1458, AR 385-11, and AR 385-30.

3.3.6.13 **Insensitive Munitions.** The system shall meet the munitions requirements of NAVSEAINST 8010.5 in the shipping and storage container. It is desired that the requirements be met with the air vehicle in the launch tube. Additionally, the capability to meet the propellent requirements of NAVSEAINST 8010.13 is desired.

3.3.7 **Human Performance/Human Engineering.**

3.3.7.1 **Human Performance.** The system concept, configuration, and operation shall be directed towards minimizing human performance requirements necessary to meet system performance requirements specified herein. The system shall not significantly degrade the typical soldiers' performance over that of the soldier armed with the predecessor system on the USAHEL Mobility/Portability course. It is desired that this performance be improved by 20%. The CLU sight shall have an adjustable diopter to facilitate weapon use by a gunner with a physical profile of 111221.

3.3.7.2 **Human Engineering.** Human engineering design shall be in accordance with MIL-STD-1472.

3.3.7.3 **Launch Environment.** Impulse noise shall not exceed the requirements of paragraph 5.4 of MIL-STD-1474. Other launch environment characteristics (e.g., windloading, thermal, visible energy, and particle/ debris effects) shall not exceed those of the predecessor system. Firing from enclosures shall not require any extraordinary protective measures.

3.4 Documentation. (Omitted from example)

3.5 Logistics. (Omitted from example)

3.6 **Manpower, Personnel, and Training.**

3.6.1 **Manpower Levels.** The manpower requirements for the ZAPPER shall be less than those of the predecessor system. The number and frequency of performance of maintenance tasks shall be considered in analyses to determine cost-effective organizational design.

3.6.1.1 **Crew Size.** In emergencies the system shall be operable by one soldier.

3.6.1.2 **Maintenance Tasks.** No single maintenance task shall require more than one soldier. Maintenance tasks, when compared to the present antitank system, shall be decreased by 20% at the unit level.

3.6.2 **Personnel.** The Target Audience Description (see Section J) lists the expected aptitude levels (ASVAB scores) of the soldiers who have been identified as the likely operators and maintainers of the ZAPPER system (see Paragraph 3.3.7.1).

3.6.2.1 **Cognitive Workload.** The cognitive workload required for performance of critical operations tasks shall be successfully handled by soldiers of the lowest 20% of the GT score range stated in the Target Audience Description.

3.6.2.2 **Aptitude.** The ZAPPER system hardware shall be maintainable to the specified performance standards by personnel holding MOS 27E30 with OF/EL scores of from 95-115. Maintenance tasks shall be simplified so that those performance standards can also be achieved by personnel holding MOS 27E30 with OF/EL scores of from 85-94.

3.6.3 **Training.** Training programs and equipment shall be specifically designed to support all phases of training from initial entry training to individual crew sustainment training. The training program shall:

(a) be developed and a plan provided to support institutional and non-institutional training for operations, maintenance, and support personnel

(b) comply with the systems approach to training (SAT) IAW TRADOC Regulations 350-7 and 350-17 and TRADOC Pam 350-30 to include front-end analysis, job and task analysis, and course design

(c) minimize the training burden through enhanced ZAPPER design and incorporation of embedded training capabilities

(d) incorporate state-of-the-art techniques in course development and instructional methods

(e) identify GFE required for training.

3.6.3.1 **Training Modes.**

3.6.3.1.1 **Institutional Training.** The institutional training program shall:

(a) qualify both initial entry and non-ZAPPER trained inservice personnel for all designations in operations, maintenance, and support

(b) provide for a 25% student surge capability

(c) use the systematic group-paced approach IAW TRADOC Reg 350-17. TRADOC will review the task analysis and identify tasks common to existing systems for contractor integration into ZAPPER courses.

3.6.3.1.2 **Non-institutional Training.** The sustainment training program shall be based on a skill retention analysis.

3.6.3.2 **Training System Characteristics.**

3.6.3.2.1 **Embedded Training (ET).** Training proposed by the contractor shall include a MILES capability and necessary equipment to interface with the NTC instrumentation system and Light Division Training Center. ET shall not adversely affect mission performance nor significantly degrade system availability, maintainability, or component life.

3.6.3.2.2 **Hands-on Training.** Contractor proposed training shall emphasize hands-on training with a goal of 70% POI time being hands-on. A learning analysis that considers current Army training methodology shall be used to determine the optimum mix of training devices required, dependent upon learning difficulty and task criticality and complexity. Use of bench maintenance components, dummy and instrumented ordnance, and simulators shall be considered for hands-on training.

3.6.3.3 **Training Device System.** A training device system shall be designed IAW results of the SAT analysis. It shall exhibit traceable hierarchial relationships to the operations, maintenance, and support tasks (individual and collective) which each individual device or simulator will train.

3.6.3.4 **Courseware.** The contractor's training program shall:

(a) include courseware developed IAW TRADOC Regulations 350-7 and 350-17, and with TRADOC Pam 350-30

(b) include an Instructor's Handbook for all hardware

(c) orient courseware to the appropriate TAD education level (i.e., NTE ninth grade RGL)

(d) provide proponent TRADOC schools with adequate information for preparation of publications involving doctrine, tactics, and evaluation (i.e., ARTEP, ATM, ITEP, STP, SQT).

4.0 QUALITY ASSURANCE PROVISIONS.

4.1 General. Unless otherwise specified in the contract, the Contractor is responsible for the performance of all inspections, examinations, tests, demonstrations, and analyses as specified herein. The Government reserves the right to perform any of the inspections where such inspections are deemed necessary to assure that materiel and services conform to the prescribed system performance requirements stated in paragraph 3.2.1 above.

4.1.1 Responsibility for Tests. (Omitted from example)

4.1.2 **Special Tests and Examinations.**

4.1.2.1 **MANPRINT Testing.** MANPRINT testing shall be performed to verify the feasibility of the required soldier performance, the accuracy of the aptitude level forecasts, the effectiveness of the proposed training program and the acceptability of the soldier-machine interfaces.

4.1.2.1.1 **Soldier Performance.** The contractor conducted soldier performance measurement (SPM) shall be designed to capture data on all tasks designated as "critical" (see paragraph 6.2.1 of MIL-H-46855) for operations, maintenance and support functions. The SPM shall require no fewer than three individuals (i.e., N=3 or more) performing (in turn) each task identified as critical. The three or more individuals selected will each either be active duty U.S. Army soldiers of the grade and MOS tentatively identified for the job to which each critical task will be assigned or, if actual soldiers are not provided to the contractor for SPM, be persons of similiar age, physical characteristics and ASVAB scores. SPM shall provide a means for relating the quantitative system performance requirements to the measured soldier performance for each critical task such that variations in the quality (timeliness and accuracy) of that performance will affect the numerical value of the metric used to express ZAPPER system effectiveness. The SPM effort shall provide for the collection of soldier performance data by measuring the time and accuracy of that performance for each critical task. The environmental conditions (temperature, humidity, illumination, noise, ventilation, vibration, etc.) under which the data were gathered shall be disclosed, and a description (referenced to any existing engineering drawings) of the soldier-machine interface (SMI) shall be included. The soldier performance data shall be analyzed by both time

and errors. Both the frequency and cause(s) of errors shall be reported and shall be supplemented (if appropriate) by explanations from participating soldiers of the reasons for their performance errors. Effects of measured soldier performance on the metric for the ZAPPER system effectiveness shall be shown, and any projected decrements in system performance shall be explained.

4.1.2.1.2 **Aptitude Levels.** Soldier performance data shall be analyzed to determine if any of the critical tasks for operations, maintenance, or support is aptitude-sensitive. Soldier performance data shall be presented (1) by each ASVAB subtest score of each soldier participant and (2) by the cluster of ASVAB subtest scores used to make MOS assignments applicable to the system being developed.

4.1.2.1.3 **Training Effectiveness.** The training program administered to the participating soldiers by the contractor shall comply with the constraints on cost and length of training. Any discrepancies shall be explained. Results of an end-of-training comprehension examination given to participating soldiers immediately before SPM begins shall be reported and analyzed. The purpose of this examination is to determine whether, prior to performance for record, the soldier-participants correctly understood the details of what they were supposed to do. Analysis of these data will include an assessment of whether any submarginal soldier performance was caused by a lack of soldier-participant aptitude, or inability of the training program to produce the required performance from a person of adequate aptitude.

4.1.2.1.4 **Soldier-Machine Interface (SMI).** The contractor-prepared evaluation of the SMI of his system shall comply with MIL-STD-1472, as tailored. This evaluation may be supplemented by statements from SPM participants concerning reasons for their performance errors and their subjective judgments concerning the layout and accessibility of controls and displays and the design of software. A narrative description (supplemented by photographs or illustrations, if appropriate) of any observed safety hazards during SPM shall be included. This analysis shall also include narrative explanations of and proposals for overcoming any:

(a) observed or reported incompatibility among tasks assigned to a single job

(b) observed or reported incompatibility between tasks assigned to different members of the same crew

(c) observed or reported incompatibility between different items of equipment in the SMI.

4.2 Quality Conformance. The verification of the requirements of Section 3 shall be satisfied when the examinations, analyses, inspections, demonstrations, and tests are successfully completed. Verifications will be performed as shown in Table 1.

TABLE 1

QUALITY CONFORMANCE VERIFICATIONS

Requirement Paragraph	Title	Verified By Analysis	Inspection	Demonstrations	Test
3.2.1.3	Target Engagement Capability	X			X
3.2.1.4	Hit Probability	X			X
3.2.1.7	Survivability	X		X	X
3.2.2.1	Weight		X		
3.2.2.2	Shape		X	X	
3.2.2.3	Length		X		
3.2.2.4	Diameter		X		
3.2.2.5	Transport and Storage			X	
3.2.2.6	Health and Safety	X		X	
3.2.3	Maintainability	X		X	
3.2.4	Environmental Conditions	X			X
3.2.5	Built-In Test/Built In Test Equipment	X		X	X
3.3.6	Biomedical, Health Hazard and Safety Assessment	X			X
3.3.7	Human Performance/Human Engineering	X		X	X
3.6	Manpower, Personnel, and Training	X		X	

4.2.1 **Analysis.** Analysis is defined as a study based on measured or analytical data that is intended to verify compliance with the requirements demanded by this specification. Data may be composed of a compilation of existing data or design solutions, and may also be derived from original, lower-level verifications. Data may also be derived from previous accepted analytical efforts. Data may be interpolated and may also be extrapolated, as applicable. Interpolations, extrapolations, and estimates shall be clearly identified as such in the text of any report of such analysis.

4.2.2 **Inspection.** Inspection is defined as investigation, without the use of special laboratory equipment, procedures, supplies, or services to determine compliance to those specified requirements which can be determined by such investigations. For implementing the inspection process, actual hardware, technical data, drawings, manufacturing processes, procedures, common test equipment, and manuals may be used. Inspection is generally non-operating and non-destructive.

4.2.3 **Demonstration.** Demonstration is defined as verification of compliance with specified functional performance requirements by system hardware/software. The

use of special instrumentation, test facilities, and data collection and analysis to verify compliance with a requirement in a "demonstration" is not precluded.

4.2.4 **Test. Test is defined as activities in the field with soldiers or in laboratories with specialized instrumentation (or a combination of both) to determine compliance with specified requirements by system hardware and software. Such tests may require special instrumentation, special/dedicated test facilities (including target vehicles and expendable materials), use of actual soldiers, data collection and processing, and formal test documentation. The analysis of data derived from testing is an integral part of the test.**

5.0 **PREPARATION FOR DELIVERY.** (Omitted from example)

6.0 **NOTES.**

6.1 **Wooden Round Concept Definition.** A logistical concept wherein a missile/rocket:

(a) Is acceptable at time of manufacture as being of an acceptable (quantitative) level of reliability

(b) Has an acceptable (quantitative) degradation of reliability throughout its service life.

(c) Requires no maintenance or operational checks throughout its service life. (Surveillance tests of the stockpile are not considered as maintenance or operational checks.)

6.2 **P_{ks} Definition.** P_{ks} equals probability of hit, given a reliable launch and flight, times the probability of kill, given hit.

6.3 **$P_{k/e}$ Definition.** Stated in the form of an equation, the effectiveness requirement in degraded conditions is:

$P_{k/engagement\ opportunity} = P_{(Recognition)} \times P_{(Reliable\ Round)} \times P_{(s)} \times P_{(Kill/Shot)}$

$P_{(s)}$ = probability that the gunner can perform all the critical tasks required to fire the round.

Achieving the minimum criterion in each of these factors will not meet the $P_{k/e}$ requirement (i.e., at least one factor must exceed the minimum acceptable value for the system to meet the overall $P_{k/e}$ requirement).

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APPENDIX A

REFERENCES

APPENDIX A

REFERENCES

Section 1
Required Publications

1.	AFARS	Army Federal Acquisition Regulation Supplement
2.	AR 15-14	System Acquisition Review Council Procedures
3.	AR 40-5	Health and Environment
4.	AR 40-10	Health Hazard Assessment Program in Support of the Army Materiel Acquisition Decision Process
5.	AR 40-14	Control and Recording Procedures for Exposure to Ionizing Radiation and Radioactive Materials
6.	AR 40-46	Control of Health Hazards from Lasers and Other High Intensity Optical Sources
7.	AR 40-501	Standards of Medical Fitness
8.	AR 40-583	Control of Potential Hazards to Health from Microwave and Radio Frequency Radiation
9.	AR 70-1	System Acquisition Policy and Procedures
10.	AR 70-8	Personnel Performance and Training Program (PPTP)
11.	AR 70-10	Test and Evaluation During Development and Acquisition of Materiel
12.	AR 70-25	Use of Volunteers as Subjects of Research
13.	AR 71-2	Basis of Issue Plans (BOIP), Qualitative and Quantitative Personnel Requirements Information (QQPRI)
14.	AR 71-9	Materiel Objectives and Requirements
15.	AR 350-35	Army Modernization Training
16.	AR 350-38	Training Device Policies and Management
17.	AR 385-9	Safety Requirements for Military Lasers
18.	AR 385-10	Army Safety Program

19.	AR 385-11	Ionizing Radiation Protection, Licensing, Control, Transportation Disposal and Radiation Safety
20.	AR 385-16	System Safety Engineering and Management
21.	AR 385-30	Safety Color Code Markings and Signs
22.	AR 570-1	Manpower and Equipment Control-Commissioned Officer Position Criteria
23.	AR 570-2	Manpower and Equipment Control-Manpower Requirements Criteria (MARC) Table of Organization and Equipment
24.	AR 570-4	Manpower Management
25.	AR 570-5	Manpower Staffing, Standards System
26.	AR 602-1	Human Factors Engineering Program
27.	AR 602-2	Manpower and Personnel Integration (MANPRINT)
28.	AR 611-101	Commissioned Officer Specialty Classification System
29.	AR 611-112	Manual of Warrant Officer Military Occupational Specialties
30.	AR 611-201	Enlisted Career Management Fields and Military Occupational Specialties
31.	AR 680-29	Military Personnel, Organization and Types of Transaction Codes
32.	AR 700-127	Integrated Logistics Support
33.	AR 1000-1	Basic Policies For Systems Acquisition
34.	DA PAM 11-25	Life-Cycle System Management Model For Army Systems
35.	DA PAM 385-16	System Safety Management Guide
36.	DA PAM 700-127	Integrated Logistic Support (ILS) Manager's Guide
37.	DoDD 4105.62	Selection of Contractual Sources for Major Defense Systems
38.	DoDD 5000.1	Major System Acquisitions
39.	DoDD 5000.3	Test and Evaluation

40.	DoDD 5000.43	Acquisition Streamlining
41.	DODI 5000.2	Major System Acquisition Procedures
42.	MIL-HDBK-245	Preparation of Statement of Work (SOW)
43.	DOD-HDBK-743	Anthropometry of U.S. Military Personnel
44.	MIL-HDBK-759	Human Factors Engineering for Army Materiel
45.	MIL-HDBK-761	Human Engineering Guidelines for Management Information Systems
46.	MIL-STD-143	Standards and Specifications, Order of Preference
47.	MIL-STD-415	Design Criteria for Test Provisions for Electronic Systems and Associated Equipment
48.	MIL-STD-454	Standard General Requirements for Electronic Equipment
49.	MIL-STD-882	System Safety Program Requirements
50.	MIL-STD-858	Testing Standard for Personnel Parachutes
51.	MIL-STD-1290	Light Fixed and Rotary-Wing Aircraft Crash-worthiness
52.	MIL-STD-1294	Acoustical Noise Limits in Helicopters
53.	MIL-STD-1316	Fuze Design, Safety Criteria for
54.	MIL-STD-1379B	Contract Training Programs
55.	MIL-STD-1379C	Military Training Programs
56.	MIL-STD-1388 1A/2A	Logistic Support Analysis/Record
57.	MIL-STD-1425	Safety Design Requirements for Military Lasers and Associated Support Equipment
58.	MIL-STD-1458	Radioactive Materials, Marking and Labeling of Items, Packages and Shipping Containers
59.	MIL-STD-1472	Human Engineering Design Criteria For Military Systems, Equipment, and Facilities
60.	MIL-STD-1474	Noise Limits For Army Materiel
61.	MIL-STD-1512	Electronic Explosive Subsystems, Electrically Initiated Designs, Requirements and Test Methods

62.	MIL-STD-1567	Work Measurements
63.	MIL-STD-2165	Testability Program for Electronic Systems and Equipment
64.	MIL-H-46855	Human Engineering Requirements For Military Systems, Equipment, and Facilities
65.	MIL-I-23659	Initiator, Electric, General Design Specification
66.	MIL-T-23991E	Training Devices, Military, General Specification for
67.	AMC Reg 385-29	Laser Safety
68.	TRADOC Reg 350-7	A Systems Approach to Training
69.	TRADOC Reg 350-17	Initial Entry Training Fill Policy and Procedures
70.	TRADOC Reg 351-1	Training Requirements Analysis System
71.	AMC PAM 700-21	Integrated Logistic System Contracting Guide
72.	AMC TRADOC PAM 70-2	Materiel Acquisition Handbook
73.	TRADOC PAM 350-30	Interservice Procedures for Instructional Development
74.	TB MED 81	Cold Injury
75.	TB MED 501	Hearing Conservation
76.	TB MED 502	Respiratory Protection Programs
77.	TB MED 506	Occupational Vision
78.	TB MED 507	Prevention, Treatment, and Control of Heat Injury
79.	TB MED 523	Control of Hazards to Health from Microwave and Radio Frequency Radiation and Ultrasound

Section 2
Related Publications

80.	DoDD 5000.39	Acquisition and Management of Integrated Logistic Support for Systems and Equipment
81.	MIL-STD-490	Specification Practices
82.	MIL-STD-961	Preparation of Military Specification and Associated Documents

83.	DoD-STD-963	Military Standard: Data Item Description (DID), Preparation
84.	Aeronautical Design Standards ADS-30	Human Engineering Requirements for Measurement of Operator Workload
85.	TR-77-024	Anthropometry of Women of the U.S. Army - 1977 (NATICK R&D Cmd) Report #II

Section 3
Other Publications

86. Chaikin, G. and McCommons, R. Human Factors Engineering Material for Manpower and Personnel Integration (MANPRINT) Provisions of the Request for Proposal (RFP), Aberdeen Proving Ground, MD: U.S. Army Human Engineering Laboratory Technical Memorandum 13-86, October 1986.

87. Lowry, J. and Seaver, D., Handbook for Quantitative Analysis of MANPRINT Considerations in Army Systems. Alexandria, VA: Allen Corporation of America Report TR-86-1, June 1986.

88. Kaplan, J. and Crooks, W., A Concept for Developing Human Performance Specifications. Aberdeen Proving Ground, MD: U.S. Army Human Engineering Laboratory Technical Memorandum 7-80, April 1980.

89. McCommons, R., Human Factors Engineering Data Management Handbook, Aberdeen Proving Ground, MD: U.S. Army Human Engineering Laboratory Technical Memorandum, 6-87, March 1987.

90. MANPRINT in the Source Selection Process. Draft manuscript prepared by Automation Research Systems, LTD, for Office, Deputy Chief of Staff for Personnel HQDA, December 1986.

91. How to Select and Develop Embedded Training: Overview of Interim Guidelines, Procedures and Supporting Documentation. Draft Manuscript prepared by Hi-Tech Systems, Inc. for U.S. Army Research Institute, March 1987.

92. Myers, Louis B., Tijerina, Louis, and Geddie, James C., Proposed Military Standard for Task Analysis. Aberdeen Proving Ground, MD: U.S. Army Human Engineering Laboratory Technical Memorandum 13-87, July 1987.

93. MANPRINT Primer, Washington, D.C.: Office, Deputy Chief of Staff for Personnel, HQDA, draft dated April 1987.

94. Guerrier, Jose H., Lowry, John C., Jones, Robert E. Jr., Guthrie, Jerry L., and Miles, John L. Jr., MANPRINT Handbook for Conducting Analysis of the Manpower, Personnel and Training Elements for A Human Factors Engineering Analysis. Alexandria, VA: U.S. Army Research Institute ARI Research Product, draft dated July 1987.

NOTE ON ORDERING PUBLICATIONS

a. DoD and Army publications should be requested through official publications channels (for Army employees). All others may request Army publications from Commander, Army AG Publications Center, 2800 Eastern Boulevard, Baltimore, MD 21220, and DoD publications from Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

b. TRADOC publications should be requested from Hq USA TRADOC, ATTN: ATCD-SP, Fort Monroe, VA 23651-5000.

c. Medical technical bulletins should be requested from The Surgeon General, HQDA (ATTN: DASG-PSP), 5111 Leesburg Pike, Falls Church, VA 22333-3248.

d. Military and DoD specifications, standards, handbooks and data item descriptions (DIDs) should be requested on DD Form 1425 from Commander, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

e. Reference 84 may be requested from Commander, U.S. Army Aviation Systems Command, (Attn: AMSAV-E1), 4300 Goodfellow Boulevard, St. Louis, MO. 63120.

f. Reference 85 is available form Defense Technical Information Center (DTIC), Building 5, Cameron Station, Alexandria, VA 22304-6145 under AD Number A044806. DTIC is a general source (for government personnel and current contractors only) of R&D reports which have completed the editorial and clearance processes.

g. References 86, 88, 89 and 92 are available from Director, Human Engineering Laboratory, ATTN: Tech Reports Office, Aberdeen Proving Ground, MD 21005-5001.

h. References 90 and 93 may be requested from Director, MANPRINT Policy Office, HQDA (ATTN: DAPE-ZAM), The Pentagon, Washington, D.C. 20310-0300.

i. References 87, 91 and 94 may be requested from Commander, U.S. Army Research Institute, (ATTN: PERI-SM), 5001 Eisenhower Avenue, Alexandria, VA 22333-5600.

j. If in doubt about how to obtain a document, consult "How to Get It - A Guide to Defense-Related Information Resources," published by the Institute for Defense Analysis and available from DTIC under AD Number A110000.

APPENDIX B

LIST OF ABBREVIATIONS AND ACRONYMS

APPENDIX B

LIST OF ABBREVIATIONS AND ACRONYMS

A

AMC	U.S. Army Materiel Command
AMSDL	Acquisition Management Systems and Data Requirements Control List
AOE	Army of Excellence
AR	Army Regulation
ARI	U.S. Army Research Institute
ARNG	Army National Guard
ARTEP	Army Training Evaluation Program
ASAP	Army Streamlined Acquisition Process
ASARC	Army Systems Acquisition Review Council
ASI	Additional Skill Indicator
ASVAB	Armed Services Vocational Aptitude Battery
ATM	Army Training Manual

B

BFV	Bradley Fighting Vehicle
BIT/BITE	Built-In-Test/Built-in-Test Equipment
BOIP	Basis of Issue Plan
BOIPFD	Basis of Issue Plan Feeder Data

C

CDR	Critical Design Review
CDRL	Contract Data Requirements List (DD Form 1423)
CLU	Command and Launch Unit
CM/CCM	Counter Measure/Counter-counter measure
COEA	Cost and Operational Effectiveness Analysis
CTEA	Cost and Training Effectiveness Analysis

D

DA	Department of the Army
DAC	Days after Contract Award
DCSOPS	Deputy Chief of Staff for Operations and Plans
DCSPER	Deputy Chief of Staff for Personnel
DID	Data Item Description
DoD	Department of Defense
DoDISS	Department of Defense Index of Specifications and Standards
DOF	Degree of Freedom
DTUPC	Design to Unit Production Cost
DUNS	Data Universal Numbering System

E

ECA	Early Comparability Analysis
EOC	End of Contract
ET	Embedded Training

G

GFE	Government-Furnished Equipment

H

HARDMAN	Hardware versus Manpower
HEL	U.S. Army Human Engineering Laboratory
HEP	Human Engineering Program
HEPP	Human Engineering Program Plan
HFE	Human Factors Engineering
HFEA	Human Factors Engineering Analysis
HHA	Health Hazard Assessment
HMMWV	High Mobility Multipurpose Wheel Vehicle
HQ	Headquarters
HQDA	Headquarters, Department of the Army

I

IAW	In accordance with
ICTP	Individual and Collective Training Plan
IEP	Independent Evaluation Plan
IER	Independent Evaluation Report
IET	Initial Entry Training
IFTE	Intermediate Forward Test Equipment
ILS	Integrated Logistics Support
IPR	In-process review
ISP	Integrated Support Plan
ITEP	Individual Training Evaluation Program
ITS	Integrated Training System
ITSP	Integrated Training System Plan

J

JMSNS	Justification for Major System New Start

L

LAV	Light Armored Vehicle
LRIP	Low Rate Initial Production
LRU	Line Replaceable Unit
LSA	Logistic Support Analysis
LSAR	Logistic Support Analysis Record

M

MAC	Months After Contract Award
MACOM	Major Command
MANPRINT	Manpower and Personnel Integration
MARC	Manpower Requirement Criteria
MILES	Multiple Integrated Laser Engagement System
MIL-HDBK	Military Handbook
MILPERCEN	U.S. Army Military Personnel Center
MIL-STD	Military Standard
MJWG	MANPRINT Joint Working Group
MMMP	Manufacturer's MANPRINT Management Plan
MOPP	Mission Oriented Protective Posture
MOS	Military Occupational Specialty
MOSC	Military Occupational Specialty Code
MPT	Manpower, Personnel, and Training
MSC	Medical Service Corps
MTOE	Modified Table of Organization and Equipment
MTTR	Mean Time To Repair

N

NBC	Nuclear, Biological, Chemical
NDI	Nondevelopmental Item
NET	New Equipment Training
NETP	New Equipment Training Plan
NETT	New Equipment Training Team
NLT	Not Later Than
NTC	National Training Center
NTE	Not To Exceed

O

OA	Operational Assessment
O&O Plan	Operational and Organizational Plan
O&S	Operation and Support
ODCSOPS	Office of Deputy Chief of Staff for Operations and Plans
OJT	On-The-Job Training
ORF	Operational Readiness Float
OSD	Office of the Secretary of Defense
OT	Operational Test(ing)
OTEA	U.S. Army Operational Test and Evaluation Agency
OTSG	Office of the Surgeon General of the Army

P

PAM	Pamphlet
PDR	Preliminary Design Review
PE	Procurement Executive
PIP	Product Improvement Proposal

PM	Program/Project/Product Manager
PMO	Program/Project/Product Management Office
PM TRADE	Project Manager for Training Devices
POI	Program of Instruction
POL	Petroleum, Oil, Lubricants
PPBES	Planning, Programming, Budgeting, and Execution System
PPTP	Personnel Performance and Training Program
PSE	Peculiar Support Equipment
P^3I	Preplanned Product Improvement

Q

QE	Quality Engineering
QQPRI	Qualitative and Quantitative Personnel Requirements Information

R

R&D	Research and Development
RAM	Reliability, Availability, and Maintainability
RDTE	Research, Development, Test, and Evaluation
RFP	Request For Proposal
RGL	Reading Grade Level
ROC	Required Operational Capability
RSI	Rationalization, Standardization, and Interoperability
RX	Repairable Exchange

S

SAR	Safety Assessment Report
SAT	Systems Approach to Training
SC	Specialty Code
SMI	Soldier-Machine Interface
SMMP	System MANPRINT Management Plan
SOW	Statement of Work
SPM	Soldier Performance Measurement
SQI	Special Qualification Identifier
SQT	Skill Qualification Test
SS	System Safety
SSC-NCR	Soldier Support Center - National Capital Region
SSEB	Source Selection Evaluation Board
SSG	Special Study Group
SSI	Specialty Skill Identifier
SSP	System Safety Program
SSWG	System Safety Working Group
STF	Special Task Force
STP	Soldier Training Package
STS	System Technical Support

T

TAD	Target Audience Description
TB MED	Technical Bulletin, Medical
T&E	Test and Evaluation
TCR	Training Conference Review
TDA	Table of Distribution and Allowances
TDNS	Training Device Need Statement
TDS	Training Device System
TECOM	U.S. Army Test and Evaluation Command
TEMP	Test and Evaluation Master Plan
TMDE	Test, Measurement, and Diagnostic Equipment
TOA	Trade-Off Analysis
TOE	Table of Organization and Equipment
TRADOC	U.S. Army Training and Doctrine Command
TR	Technical Report
TSG	The Surgeon General of the Army
TT	Technical Testing
TWS	Thermal Weapon Sight

U

USAHSC	U.S. Army Health Services Command
USAMRDC	U.S. Army Medical/Research and Development Command
USASC	U.S. Army Safety Center
USAR	U.S. Army Reserve
USMC	U.S. Marine Corps

W

WBS	Work Breakdown Structure
WRAIR	Walter Reed Army Institute of Research

APPENDIX C

AGENCIES WITH MAJOR MANPRINT RESPONSIBILITIES

APPENDIX C

AGENCIES WITH MAJOR MANPRINT RESPONSIBILITIES

ADDRESS	TELEPHONE
Deputy Chief of Staff for Personnel HQDA (DAPE-ZAM) Washington, DC 20310-0300	Autovon: 225-9213 Commercial: (202) 695-9213
The Surgeon General HQDA (DASG-PSP) 5111 Leesburg Pike Falls Church, VA 22041-3248	Autovon: 289-1029 Commercial: (703) 756-1029
U.S. Army Materiel Command 5001 Eisenhower Avenue Alexandria, VA 22333-0001	
Deputy Chief of Staff for Development, Engineering, and Acquisition	Autovon: 284-5696 Commercial: (703) 274-5696
U.S. Army Training and Doctrine Command FT. Monroe, VA 23651-5000	
Deputy Chief of Staff for Combat Developments, Personnel Development Division, Combat Service Support Directorate	Autovon: 680-3851/4225 Commercial: (804) 727-3851 (804) 727-4225
Deputy Chief of Staff for Training	Autovon: 680-4359 Commercial: (804) 727-4359
U.S. Army Medical Research and Development Command ATTN: SGRD-PLC FT Detrick, Fredrick MD 21701-5012	Autovon: 343-7301 Commercial: (301) 663-7301
U.S. Army Health Services Command Commander, Academy of Health Sciences ATTN: HSHA-CDM FT Sam Houston, TX 78234-6100	Autovon: 471-3403 Commercial: (512) 221-3403
U.S. Army Operational Test and Evaluation Agency 5600 Columbia Pike Falls Church, VA 22041	Autovon: 289-2487 Commercial: (703) 756-2487 (703) 756-1818
U.S. Army Military Personnel Center Hoffman II Building 200 Stovall Street, Alexandria, VA 22332	Autovon: 221-8844 Commercial: (703) 325-8844

U.S. Army Research Institute for the Behavioral and Social Sciences 5001 Eisenhower Avenue Alexandria, VA 22333-5600	Autovon: 284-8917 Commercial: (703) 274-8917
U.S. Army Safety Center ATTN: System Safety Officer FT Rucker, AL 36363-5363	Autovon: 558-3943 Commercial: (205) 255-3943
Human Engineering Laboratory Aberdeen Proving Ground, MD 21005-5001	Autovon: 298-5828 Commercial: (301) 278-5828
Project Manager for Training Devices Naval Training Center Orlando, Fl 32813	Autovon: 791-5757 Commercial: (305) 646-5157
Soldier Support Center, National Capital Region ATTN: NCR, 200 Stovall St., Hoffman II Building Alexandria, VA 22193	Autovon: 221-0330 Commercial (703) 325-0330
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Ordnance Missile and Munitions Redstone Arsenal, AL	Autovon: 746-5891 Commercial: (205) 876-5891
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Quartermaster, FT Lee, VA	Autovon: 687-3476 Commercial: (804) 734-3476
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APPENDIX D

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ALEXANDRIA, VIRGINIA 22333-0001

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